The Effect of Animal-Assisted Therapy on Nursing Student Anxiety

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Abstract

College students have high levels of stress, anxiety, and loneliness (Stewart , Dispenza, Parker, Chang, & Cunnien, 2014). College campus counselors strive to combat this stress and meet student needs through creative solutions (Stewart et al., 2014). Nursing student stress has a major impact on academic performance and testing anxiety is one prominent source of that stress (Gibbons, Dempster, & Moutray, 2011). The purpose of this study was to evaluate the influence of dogs in decreasing student anxiety at a Bachelor of Science in Nursing (BSN) program prior to a medication dosage calculation exam. This study uses a convenience sample randomly assigned to a control and intervention group for assessment of anxiety levels through a pre-pre, pre, post, and post-post test using the Spielberger State-Trait Anxiety Inventory (STAI). The intervention group experienced a therapy dog intervention prior to the medication dosage calculation exam. Qualitative information was collected through open-ended questions to determine the influence of the therapy dogs on the students' anxiety levels; this information was categorized for themes and follow-up interviews completed for the most positive and negative perceptions. Using a repeated measures one-way MANOVA, $p < .05$, there is a statistically significance difference between groups Wilk's $\Lambda = .761$, $F(8, 79) = 3.103$, $p < .01$. Qualitatively, the results were positive showing the intervention calmed and relaxed students. This adds empirical knowledge to the field of animal-assisted therapy and nursing student anxiety-coping methods.

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"Never give up on a dream just because of the time it will take to accomplish it. The time will pass anyway." --Earl Nightingale.

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The Effect of Animal-Assisted Therapy on Nursing Student Anxiety

College students have high levels of stress, anxiety, and loneliness (Stewart , Dispenza, Parker, Chang, & Cunnien, 2014). Contributions to this stress and anxiety include a demanding class schedule, being away from home for the first time, adjusting to the level of performance expected for assignments and testing, a tendency toward negative emotions, and coping techniques that are inadequate (Nelson & Knight, 2010). College campus counselors strive to combat this stress and meet student needs through creative solutions (Stewart et al., 2014). Some of those possible solutions to assist with student stress are biofeedback, mindfulness, and access to school counselors (Patterson, 2016; Prato & Yucha, 2013; van der Riet, Rossiter, Kirby, Dluzewska, & Harmon, 2015). Pines et al. (2012) found that in a convenience sample of 166 baccalaureate nursing students, stress pre-disposing scores and dwelling on negative thoughts were higher than average for the Stress Resiliency Profile (SRP). Nursing student stress has a major impact on academic performance and testing anxiety is one prominent source of that stress (Gibbons et al., 2011). Nursing students have stress from testing during course evaluations, medication calculation testing for clinical, and their highest stakes test, the National Council Licensing Exam (NCLEX) to determine licensure to practice as a registered nurse.

Animal-Assisted Therapy (AAT) may be a solution to assist in decreasing anxiety for nursing students. Crump and Derting (2015) reported that AAT has greater stress reduction than other methods, such as mindfulness, reading quietly, and biofeedback. Literature shows animals decrease anxiety and provide emotional support in schools K-16 (Barker, Barker, McCain, & Schubert, 2016; Baumgartner & Cho, 2014; Binfet & Passmore, 2016; Chandler, Portrie-Bethke, Barrio Minton, Fernando, & O'Callaghan, 2010; Crossman, Kazdin, & Knudson, 2015; Daltry &

Mehr, 2015; Jalongo & McDevitt, 2015; Jenkins, Laux, Ritchie, & Tucker-Gail, 2014; Kathleen N. Adamle RN, Tracy A. Riley RN, & Tracey Carlson RN, 2009; Stewart, Dispenza, Parker, Chang, & Cunnien, 2014; Torres, Arnold, & Shutt, 2016; Wilson, 1991). Nursing faculty continue to look for innovative stress relieving activities for students in an effort to decrease anxiety and promote success. Animal-assisted therapy (AAT) may also reduce nursing student anxiety.

The purpose of this study is to evaluate the effects of animal-assisted therapy (AAT) on student anxiety associated with a medication dosage calculation examination for a Bachelor of Science in Nursing (BSN) program. This study will provide additional insights into nursing student stress and a potential treatment to assist for reducing student anxiety.

Statement of the Problem

The purpose of this study is to evaluate the effects of animal-assisted therapy (AAT) on student anxiety associated with a medication dosage calculation examination for a Bachelor or Science in Nursing (BSN) program. This University School of Nursing is a small private university with approximately 165 nursing students. The NCLEX pass rate is 96%, which is higher than the national average of 83.04% and higher than the state average of 79.96%. The average attrition rate for the school is 85-90%. The medication calculation exam being considered for this study shows the last two semesters' mean pass rate as 76.47% for the students' initial test attempt.

The students have three attempts to complete the 90% proficiency during the 1.5 weeks prior to attending clinical courses. Upon returning to school at the beginning of each semester, students are required to complete a medication calculation test. A different version of the test with increased difficulty is administered with each level of progression through school. For each

level (2nd level is second semester juniors, 3rd level is first semester seniors, and 4th level is second semester seniors), there are different versions of the test given if the student is unable to achieve the 90% proficiency on the first attempt. The tests are computerized and consist of fill-in-the-blank questions with the answer being the product of a medication dosage calculation. The test questions are produced by the nursing faculty and address medication calculations pertaining to patient medication administration scenarios.

Nursing students experience stress from high performance expectations for examinations (Prato & Yucha, 2013). These students verbalize experiencing stress and anxiety during antecedent testing time. Nursing requires a vast amount of knowledge, technical skills, and a caring attitude in highly emotional environments (Prato & Yucha, 2013). Many students experience maladaptive coping mechanisms such as alcohol consumption to deal with school stressors (Reeve, Shumaker, Yearwood, Crowell, & Riley, 2013). "Nursing students experience high levels of stress due to the rigorous academic and emotional demands placed on them when they begin to take responsibility for patient care" (Reeve et al., 2013). Examples of the student stress can be seen in actions such as facial expressions, shaking, deep sighing, becoming unusually quiet or unusually loud, eye rolling, and extensive verbalization of frustrations. Students name clinical performance as a major stressor due to a perceived knowledge and skill deficit along with caring for a real patient (Jimenez, Navia-Osorio, & Diaz, 2010). Although clinical courses are stressful for students, they are an essential piece of a nursing education and the ability to successfully complete medication calculations is a safety issue. If a student is unable to calculate a medication dosage correctly, it could lead to a patient receiving the wrong dosage of medication that can cause detrimental effects to health and sometimes even death.

Purpose of the Study

The purpose of this study is to examine the effect of animal-assisted therapy as a method for reducing anxiety in BSN nursing students prior to completing a medication calculation examination.

Research Questions

1) Does exposure to therapy dogs prior to a medication calculation examination in a college nursing school affect student anxiety?

2) How do students perceive the therapy dog interaction?

3) Does animal-assisted therapy impact the students' medication calculation exam scores?

Null Hypotheses

Ho:

1. Nursing student anxiety associated with a medication calculation exam shows no difference between intervention and control groups when students are provided animal-assisted therapy.
2. Nursing students perceive animal-assisted therapy as having no impact on their anxiety level prior to the medication calculation exam.
3. Nursing student medication calculation exam pass rates show no impact when students are provided animal-assisted therapy.

Literature Review

This study examines if exposure to therapy dogs effects students' anxiety prior to a medication calculation exam in a baccalaureate-nursing program. The literature supports the use

of animal-assisted therapy in several life situations for reducing stress and anxiety as well as adding personal comfort and increasing quality of life.

Anxiety

Zuckerman and Spielberger (1976) have identified anxiety as an unpleasant state that feels bad but is not localized or easily identified: however, the person wants to reduce it or avoid it. "Anxiety is to designate a strongly personal, phenomenally experienced feeling of distress and anguish" (Zuckerman & Spielberger, 1976, p. 36). "People are evaluating organisms that search the environment for cues about what is needed or desired and evaluate that input for relevance and significance" (Spielberger, 1972, p. 242). Different people react to anxiety differently and the same person reacts to anxiety differently at different times; however, some people tend to have higher anxiety in general or a trait (Zuckerman & Spielberger, 1976).

When a person feels stress from the environment, the person completes a primary appraisal to determine if the event will cause harm/loss, is neutral and does not effect him or her, or if the event will have a positive outcome (Folkman, 1984; Folkman & Lazarus, 1985, 1988, Lazarus & Folkman, 1984a, 1987). Stress is the relationship between the person and environment where the person considers that the relationship exceeds his or her resources and is possibly a danger or threat to his or her person (Folkman, 1984). The person performs a secondary appraisal of the stressful event when he or she determines something should be done about the threat, which is then followed by the process of coping (Folkman, 1984; Lazarus & Folkman, 1984a, 1987; Spielberger, 1972). To summarize the relationship, the person experiences stress, the event or encounter with the environment and when the person perceives that stress as overloading his/her coping skills, then the person experiences anxiety, the unpleasant feeling the person wants to avoid.

K-12 Student Anxiety

Anxiety plagues students from kindergarten to university level. Many elementary aged school children exhibit anxiety; chronic and high levels of anxiety in elementary students are more likely to result in high school non-completion (Duchesne, Vitaro, Larose, & Tremblay, 2008). The elementary students with chronic and high anxiety are more likely to excessively worry, think negatively about themselves, and believe they have little control over their learning (Duchesne et al., 2008). Elementary students experience statistically significant test anxiety associated with high-stakes testing over classroom testing; however, classroom testing is also associated with high levels of anxiety (Segool, Carlson, Goforth, von der Embse, & Barterian, 2013). Elementary students in a testing environment also show less ability to process mathematics due to anxiety ("Math Anxiety in Elementary School," 2013). High school students also experience anxiety associated with mathematics testing that impacts their Grade Point Average (GPA) supporting the previous research of anxiety impairing cognitive ability (Karatas, Alci, & Aydin, 2013). Additionally, high school students whose attitude toward mathematics is low positive have a high positive level of anxiety (Dursun, 2015).

University / College Student Anxiety

As students move into the university realm, anxiety continues to be prevalent. Negative thinking and inadequate coping skills create a continuous cycle of anxiety and stress (Mahmoud, Staten, Lennie, & Hall, 2015; Nelson & Knight, 2010). In a study using a positive-thought intervention, students scored higher than the control group on a 15-pt pop quiz (Nelson & Knight, 2010).

Test anxiety is a major problem for some students prompting them to seek professional help to deal with the issue (Spielberger & Vagg, 1995). "Negative, self-centered worry

responses were incompatible with good performance, the high test-anxiety students also did more poorly on learning tasks, and on intelligence and achievement tests, than did low test-anxious students" (Spielberger & Vagg, 1995, pp. 5–6). As people focus more on anxiety, there is less cognitive ability available for processing tasks (Lazarus & Folkman, 1984a; Maloney, Sattizahn, & Beilock, 2014; Spielberger & Vagg, 1995). Less cognitive ability is seen in students in a testing environment where worry, defined as a cognitive concern about an outcome or event, is negatively related to achievement (Spielberger & Vagg, 1995).

Nursing Student Anxiety

Novice and expert nurses experience academic and clinical stress such as lack of knowledge and skills for quality patient care, seeing patients in pain and suffering from illness, and being unable to provide correct answers for patients, physicians, faculty, and other nurses when questioned (Jimenez et al., 2010). These concerns are observed in physiological symptoms such as fingers and toes becoming numb, feeling nausea and even vomiting, and feeling like nervousness and worry are going to cause a breakdown (Jimenez et al., 2010). Nursing students experience stress and anxiety from learning medical language, fear of making a mistake in the clinical setting, not knowing how to complete a nursing task or manage patient assignments, being unable to think of what is needed to help a patient, fear of the environment, and making a mistake that will cause harm to a patient due to lack of skills or knowledge (Cowen, Hubbard, & Hancock, 2016). In a study examining nursing student burnout and attrition, students who had high levels of neuroticism and emotion-oriented coping had higher levels of attrition than other students (Deary, Watson, & Hogston, 2003). The students who left the program had lower scores on agreeableness and conscientiousness (Deary et al., 2003). Emotional-oriented coping,

avoidance, and distraction strategies indicated negative coping methods to handle stress and anxiety in the nursing program (Deary et al., 2003).

Many nursing schools require students to perform above a certain average on testing to continue progression in the program; additionally, testing anxiety is prevalent and reduces the ability to demonstrate knowledge in the program (Prato & Yucha, 2013). Undergraduate nursing students completing mathematics dose calculation testing had low understanding of mathematics concepts, increased anxiety, and low confidence in skills (Bagnasco et al., 2016; Mackie & Bruce, 2016). The students' anxiety level and low attitude towards mathematics interferes with dose calculation ability and lowers test scores (Williams & Davis, 2016). In a study (n=1270) in undergraduate nursing students in Hong Kong, age and gender were not statistically significant when reporting anxiety and stress; additionally, unhealthy coping mechanisms included gambling, drinking alcohol, smoking, illicit medication use, and poor self-perceived physical and mental health (Cheung et al., 2016).

Some techniques to reduce anxiety have been used for nursing students. Prato and Yucha (2013) found that using biofeedback and relaxation techniques did not statistically significantly reduce testing anxiety on the Testing Anxiety Inventory (TAI); however, students reported in an open-ended questioning that they felt like their anxiety was decreased. Patterson (2016) researched the use of Emotional Freedom Technique (EFT), a light tapping of traditional acupuncture pressure points and found it to be statistically significant comparing weeks 0 to 5 and open-ended questioning found that participants verbalized a decrease in tension and anxiety. A small study of undergraduate nursing students conducted by van der Riet, Rossiter, Kirby, Dluzewska, and Harmon (2015) investigating undergraduate nursing students (n=10) reported that mindfulness with attending to self through self-awareness and management including

focusing on studying and being present in the moment were beneficial. Shearer, Hunt, Chowdhury and Nicol (2016) conducted a study (n=74) of undergraduate students in a psychology course and found that mindfulness and interacting with a dog during a group study break were both significant for reducing anxiety over the control group; however, the mindfulness group was the only group with significant heart rate variability showing a reduced physiological response to stress.

Theoretical Models

The theories framing this study are the Transactional Theory of Stress developed by Lazarus and Folkman (1984) and Neuman's System Model developed by Betty Neuman (1972).

Transactional Theory of Stress (TTS)

The Transactional Theory of Stress (TTS) originated with Lazarus in 1966 and has since grown to its landmark model of Lazarus and Folkman in 1984. The Transactional Theory of Stress evaluates the relationship between the person and the environment and "views the person and the environment in a dynamic, mutually reciprocal, bidirectional relationship" (Lazarus & Folkman, 1984a, p. 293). This metatheory consists of "…two main theoretical constructs of the system, appraisal and coping; and develop measures of daily stress, appraisal and coping in order to study the empirical relationships among the so-called antecedent, mediating, and outcomes variables that comprise the stress process" (Lazarus & Folkman, 1987, p. 142). The three themes of this theory are relationship or transaction, process, and viewing emotion as a system of interdependent variables. There is a relationship between the person and environment and how the person reacts to the environment or situation is a process which is the emotional system (Lazarus & Folkman, 1987). A transaction results from the person and environment forming one relationship or a "new level of abstraction" (Lazarus & Folkman, 1984a, p. 294). The construct

of cognitive appraisal means humans are continuously in the process of evaluating what is happening to them and the construct of coping is what humans do to impact the outcome and maintain well-being (Lazarus & Folkman, 1987). Cognitive appraisal is the "evaluation of harm, threat, and challenge" (Lazarus & Folkman, 1984a, p. 294). This is not a cause and effect relationship but a process where a person appraises the environment and integrates with the environment for ongoing transactions with that environment (Lazarus & Folkman, 1984a). How the person copes is the process of dealing with the "flow of events" (Lazarus & Folkman, 1984a, p. 295). From the "flow of events" the "meaning" of the relationship changes over time depending on the situation (Lazarus & Folkman, 1984a, p. 295). This change over time is represented in the three stages of testing, prior to the exam during studying, during the actual act of taking the exam, and after the exam waiting for the grade, where coping changes as events happen (Folkman & Lazarus, 1985).

"Stress is not a property of the person or environment, nor is it a stimulus or a response. Stress is a particular relationship between the person and the environment" (Folkman, 1984, p. 840). The transactional theory of stress is a cognitive theory using primary appraisal, secondary appraisal and coping as the three pieces in the stress process (Lazarus & Folkman, 1984b). The primary appraisal is the judgment of the stressed person as to whether the stressor is, "irrelevant, benign-positive, or stressful" (Folkman, 1984). The secondary appraisal is the decision about what to do when the primary appraisal is a threat, loss, or presents a challenge; situational control is part of this appraisal stage (Folkman, 1984). The coping process is the attempt to manage the demands of the stressor, and it is the efforts to reduce the stress; the coping methods are the personal resources of physical, social, and emotional aspects that are independent of the outcome of the stressor or stressful situation (Folkman, 1984). Stress is a dynamic event and not a single

situation (Folkman & Lazarus, 1985). For there to be stress, there must be a person and an environment and a relationship between the two; there has to be an interaction that produces the stress and there must be appraisal for the person to perceive the stress (Lazarus, DeLongis, Folkman, & Gruen, 1985).

Neuman's System Model (NSM)

In Neuman's (1995) System Model (NSM) for nursing, people are considered an open system and should be viewed holistically as a system that needs stability. Each person is unique and should be viewed as a whole person with goals of "order, unity, and wellness" (Neuman, 1995, p. 95). The whole person or the open system has a "basic structure, lines of resistance, normal line of defense, and flexible line of defense" and in a "cognitively impaired" individual all areas are affected (p. 250). The basic structure is the person's baseline cognitive functioning which should be assessed so changes in cognition are able to be evaluated in the future (Neuman, 1995). The flexible line of defense acts as the first buffer or cushion to help maintain the stable, steady state of balance; if that is not functioning then the normal line of defense is approached which contains coping patterns, support systems, and defenses that change with age and development (Neuman, 1995). The internal lines of resistance are the last line to protect the basic cognitive structure by controlling reactions of the individual (Neuman, 1995). Within the person system, psychological stressors decrease cognitive functioning of the basic structure and the lines of defense are weakened (Neuman, 1995). The environment is all factors that affect the system with an internal environment of how a person deals with the stressor and an external environment of the stressful situation (Neuman, 1995). The goal is homeostasis or to "maintain a steady state or balance" (p. 12) and "growth and expansion" (p. 13) happen from being able to keep the system in balance (Neuman, 1995).

Application of theoretical framework for nursing students

Stress is not necessarily a bad thing because some people "grow" from stress (Lazarus & Folkman, 1984a). But if the person has weakened lines of defense and the basic structure is cognitively impaired, the person is unable to cope (Neuman, 1995). If the person is unable to cope, it will have long-term illness effects on social, psychological, and physiological functioning (Folkman & Lazarus, 1985). Stress is found in all aspects of life. How a person deals with that stress is what the transactional theory of stress explains. A person's appraisal of an environment that is stressful, demanding, or threatening and the available resources that person implements in the situation is a pivotal behavioral response (Eschleman, Alarcon, Lyons, Stokes, & Schneider, 2012). In a longitudinal study where individuals completed increasingly complex team-based tasks, mood and stress levels were assessed three times; the results showed individuals who experienced increased demands were more likely to exhibit a greater decrease in the ability to cope (Eschleman et al., 2012).

When breaking down transactional into its root of "trans," it means "through" and transaction is to "carry through" as well as "process" (Harper, 2010). The transaction carries a person through the process of coping after the primary and secondary appraisals are completed, which happens over time as a person assesses the environment and situations. Because this theory emphasizes the transaction rather than an interaction, which would refer to an encounter between two things, Spielberger's definition of anxiety as a trait characteristic is reinforced. The trait of anxiety continues through process and time and so remains stable as part of a person's outlook on life. As transactions in life happen, the person's trait anxiety is affected by state anxiety, through encountering stress during the primary appraisal that the person is continuously completing. Connecting the Transactional Theory of Stress and Spielberger's State-Trait

Anxiety with Neuman's System Model of Nursing, the person who has weakened lines of defense has a higher trait anxiety. This person is unable to maintain homeostasis through time perceiving stress during the primary appraisal as a larger threat than it actually is; so the person has increased state anxiety reaction when encountering life's obstacles.

For nursing students this delicate balance of coping and stress is tested daily. When the flexible lines of defense are impaired and the normal lines of defense are weakened, then faulty coping processes happen which impacts the lines of resistance giving the student a more severe reaction to a stressor and a longer recovery time to be ready for the next stressor (Neuman, 1995). During the appraisal period (Lazarus & Folkman, 1984) the student over-estimates the threat of the stressor to person and has high anxiety about the effect of the situation; because the coping process is impaired, the basic structure is impaired. The medication calculation exam is a barrier to the student participating in clinical coursework that is necessary in order to become a competent novice nurse. When the student appraises the exam as a threat to the system, the student begins the process of coping. If the student has had previous unpleasant experiences with the exam, the coping process will be heightened negatively due to the perceived increased threat.

Animal-Assisted Therapy to Reduce Anxiety

Seeking social support and problem-focused coping have a correlation of $r = .64$ where social support surrounding the stressful encounter increased coping effectiveness and that people seek out social support during coping (Dunkel-Schetter, Folkman, & Lazarus, 1987; Folkman & Lazarus, 1985). One form of social support found to be effective is pet therapy. In an effort to reduce students' anxiety, colleges and universities across the United State are finding success with animal visitation programs (AVP), animal-assisted therapy (AAT), or animal-assisted

activities (AAA) (Barker, Barker, McCain, & Schubert, 2016; Bell, 2013; Crump & Derting, 2015; Daltry & Mehr, 2015; Adamle, Riley & Carlson, 2009; Stewart, Dispenza, Parker, Chang, & Cunnien, 2014; Young, 2012). Students characterized AAT sessions as an excellent experience, positive stress reduction, and a feeling of support when offered during Finals Week (Bell, 2013; Binfet & Passmore, 2016; Young, 2012).

Historical perspective

Historically, dogs have been found to have a positive influence on people's lives. Levinson, a clinical psychologist, first used animal-assisted therapy accidentally in 1960 for a boy who had become increasingly withdrawn and was on the verge of hospitalization. Levinson's dog was in his office when a mother and child arrived hours early for an appointment. The boy was eventually rehabilitated through the development of a rapport with the dog and Levinson (Levinson & Mallon, 1997). Levinson presented this at the Annual Convention of the American Psychological Association in 1961 with his colleagues giving both positive and negative reviews. Levinson believed that the negative reviews stemmed from the anxiety over human relatedness to our nonhuman environment; and so began the field of animal-assisted therapy (Levinson & Mallon, 1997).

Quality of life

For children, pets not only bring pleasure but also teach them a sense of responsibility about caring for another living being and for adults, pets serve as companionship and as an aid to health and relaxation (Pachana, Massavelli, & Robleda-Gomez, 2011). A qualitative study (n=27) reported companion dogs increased quality of life and overall perception of health (Maharaj & Haney, 2015).

Cardiovascular benefits are found from walking with a dog and the effect of pet ownership provides a protective benefit (Cangelosi & Sorrell, 2010; Giaquinto & Valentini, 2009). In a small study (n=12), obese children age 8-12 years old increased physical activity, walking faster for longer, significantly in the presence of a therapy dog as compared to the presence of a human; however, self-reported motivation, satisfaction, and wellbeing were not statistically significant (Wohlfarth, Mutschler, Beetz, Kreuser, & Korsten-Reck, 2013). Obese adults in the U.S. also benefit from dog walking losing an average of 14.4 pounds over a 50-week walking program and verbalize the commitment to walking the dogs because "they need us to walk them" (Johnson & Meadows, 2010). Similar study findings have been found in Australia and Canada (Johnson & Meadows, 2010). In a study in Mexico (n=254) there was a significantly lower score for dog owners than non-dog owners on psychosomatic and stress symptoms and higher for absence of bodily pain, general health, vitality, and social functioning; however, dog owners and non-dog owners did not differ in their reporting of life satisfaction or happiness (González Ramírez & Landero Hernández, 2014). Blood pressure and heart rate are also statistically significantly lowered in adults and mood is elevated when participating in a pet therapy program within a hospital (Coakley & Mahoney, 2009). Children in a post-operative hospital setting had decreased systolic blood pressure and lower pain perception from interacting with a dog (Calcaterra et al., 2015; Chia-Chun Tsai, Friedmann, & Thomas, 2010; Vagnoli et al., 2015). An adult study of hospitalized patients also reported a decrease in pulse and pain after an animal-assisted activity program (Nepps, Stewart, & Bruckno, 2014). After interaction with a dog, university students had significantly lower baseline diastolic blood pressure (Somervill, Kruglikova, Robertson, Hanson, & MacLin, 2008).

Interactions with dogs have other physiological effects on people. The presence of a dog, either the person's own or unfamiliar dog, was found to decrease cortisol levels, blood pressure, and heart rate in adults (Barker, Knisely, McCain, Schubert, & Pandurangi, 2010). Dogs gazing at their owners produced increased levels of oxytocin, a hormone that increases pleasure and positive feelings, in pet owners in Japan showing a physiological response to the benefits of interaction with a dog (Nagasawa, Kikusui, Onaka, & Ohta, 2009). Autistic children benefited from pet ownership by improved social skills (Carlisle, 2014; Viau et al., 2010) and decreased salivary cortisol, stress hormone levels (Viau et al., 2010). Pets were cited as the top coping mechanism for adolescents diagnosed with type I diabetes (Walker, Johnson, Schatz, Silverstein, & Rohrs, 2015).

A study of older adults (n=5,210) showed that women who reported owning a pet showed decreased loneliness (Pikhartova, Bowling, & Victor, 2014). Self-reported depression and anxiety were reduced in adult hospitalized patients from animal therapy interaction (Nepps et al., 2014). Pet ownership was found to assist patients with serious mental illness in recovery through providing empathy, therapy, "family," supporting self-efficacy, and empowerment (Wisdom, Saedi, & Green, 2009). AAT psychosocial interventions are used for adolescents, children, and adults (Chandler et al., 2010; Chandramouleeswaran & Sudhakar Russell, 2014). Therapy dogs also have positive effects on dementia patients and residents in long term care centers increasing socialization and implementation of programs across the United States (Behling, Haefner, & Stowe, 2011).

Pet popularity

The United States spent $60.28 billion in 2015 and 54.4 million households own a dog, which accounts for 77.8 million dogs (American Pet Products, 2016). In an online global survey

(n=27,000 of 22 countries), Argentina (82%), Mexico (81%), and Brazil (76%) had the highest rates of pet ownership, dogs being the most popular, with the U.S. ranking fifth; Asian countries had the smallest percentage of pet ownership with South Korea at 31%, Hong Kong 35%, and Japan at 37% (GfK, 2016). Middle eastern countries and Indonesia also have very low per capita dog ownership rates being contributed to Islamic tradition of dogs being unclean and India has the fastest growth rate of dogs in 53 countries surveyed but not necessarily pet owners which is a significant health problem due to rabies (Bradley & King, 2012). The top states for U.S. pet ownership are Vermont, New Mexico, South Dakota, Oregon, Maine, Washington, Arkansas, West Virginia, Idaho, and Wyoming (San Filippo, 2013).

Animal-assisted therapy classifications

There are differences in the classification of helping dogs. Service dogs are classified as a dog that helps a person with a disability such as blindness, mobility, seizures, or psychiatric assistance and has received specialized training to assist and interact with that person (Parenti, Foreman, Jean Meade, & Wirth, 2013; Shubert, 2012). The therapy dog is for comfort and emotional support and assists a health care professional with therapeutic treatment of individuals; the dog is certified but not specifically to a certain individual with a certain disability (Parenti et al., 2013; Shubert, 2012). The American Disabilities Act (ADA) recognizes service dogs under the law but does not recognize therapy dogs; therefore service dogs are allowed by law to accompany their person into any facility but therapy dogs are only allowed where any other dog would be allowed (Parenti et al., 2013; Shubert, 2012). There is also a national accreditation through Assistance Dogs International for organizations raising and training guide, service, or facility dogs (KSDS Assistance Dogs, Inc., 2015).

Considerations for Animal-assisted therapy programs

Therapy dogs and their handlers are required to meet certain standards. The handler must complete training and the dog must be certified showing socialization for human interaction; the dog is supervised by the handler at all times; and the dog is cleared by a veterinarian with physical exam, vaccinations, fecal exam test for parasites, cleanliness pertaining to bathing, nail trimming, and free from fleas; have no signs of illness; and carry identification that the dog is a therapy dog (DiSalvo et al., 2006). Potential allergies to dander are decreased through the animals bathing and grooming (DiSalvo et al., 2006). Although the dogs have a very low probability of biting someone, due to their animal nature, handlers and their dogs are also required to carry liability insurance (personal communication, Raven Rajani, Loving Paws Animal-Assisted Therapy LLC., October 24, 2016). Therapy dogs can be charged through insurance under a provider's order and also be contracted for group visits to college campuses and other organizations; many times volunteers visit with their therapy dogs for free or at a low cost to the organization (personal communication, Raven Rajani, Loving Paws Animal-Assisted Therapy LLC., October 24, 2016).

The therapy dogs also receive a benefit from the social interaction with people during a therapy session. In a study measuring urinary oxytocin as a measure of pleasure, a pre and post urine sample was collected from dogs when drinking water, eating, exercising, and being petted. The urinary oxytocin changes were statistically significant for eating, exercising ($p<.05$), and petting ($p<.01$) (Mitsui et al., 2011). In addition to increasing oxytocin, eating also raised cortisol or stress hormone levels but exercise and petting did not (Mitsui et al., 2011). Another study assessed the oxytocin levels of dogs and their owners as they gazed at each other; oxytocin levels raised significantly in both owners and dogs (Nagasawa et al., 2015). Additionally, longer gazing showed higher levels of oxytocin than shorter gazing and the results were only significant

with owners and their dogs not between dogs and an unfamiliar human (Nagasawa et al., 2015). This relationship between dog and owner mimics the infant-mother human bond through the presence of the social interaction and the oxytocin levels (Nagasawa et al., 2015).

Implications for students

"Because animals slip under the radar of human defense mechanisms, animal presence in the therapeutic setting, either direct or indirect (e.g. as a story character), may help open a window into the person's or family's underlying issues" (Fine, 2010, p. 227). Elementary school children appear to see dogs as non-judgmental and offering social and emotional support (Friesen, 2009). In a study of preschool children completing a memory task, fewer prompts were necessary when in the presence of a real dog; this study was replicated twice with significant findings (Gee, Crist, & Carr, 2010). A similar study showed the preschool children completed the memory task faster and with greater accuracy in the presence of a real dog as compared to the absence of the dog (Gee, Harris, & Johnson, 2007). Even when self-conscious about reading ability, elementary school children have increased success in reading aloud in the presence of a dog in the classroom. Middle school students also regard a therapy dog as having empathy and congruence traits where they felt comfortable forming a relationship with the school counselor and AAT dog (Jenkins et al., 2014).

Barker et al. (2016) found a significant reduction in perceived student stress following a brief animal-assisted therapy intervention, but not reduced physiological symptoms in salivary cortisol levels. The animal visitation program is also a low cost and easily implemented method for colleges to provide stress reduction options to their students (Barker et al., 2016; Crump & Derting, 2015; Daltry & Mehr, 2015). Binfet and Passmore (2016) report that an 8week dog-therapy program for first year university students reduced homesickness, increased satisfaction

with life, and gave them a sense of belonging to a community. Through participation in a pilot outreach program in a college counseling center, significant decreases were reported in students' self-reported anxiety and loneliness (Stewart et al., 2014).

Implications for Baccalaureate Nursing Students

Young (2012) found that a dog in the nursing school library reduced student anxiety scores; although the study was not significant, there were some large individual reductions in anxiety scores. The University of Pennsylvania library dog therapy program during finals week also reported success in students becoming relaxed and focused for their next exam (Jalongo & McDevitt, 2015). Crossman and Kazdin (2016) found that brief unscheduled or unstructured interaction with a dog reduces subjective stress more than merely taking a break or engaging in a distracting "novel" experience and this stress reduction was experienced by all students whether they had positive histories interacting with dogs or expected the dog therapy to be a positive experience.

Dogs to Reduce Anxiety in Students on Mathematics / Medication Calculation Examinations

In a study on mathematics anxiety, college students were presented with images of pets, desks, or color blocks along the border of the left side of the page; the pet border had lower stress ratings than desks but did not improve performance on the exam as compared to the color blocks (Torres et al., 2016). Another study asked participants to subtract 17 from 2023 until they reached zero (Trier Social Stress Test) in the presence of an unfamiliar dog or in the presence of a human friend; the results were significant for decreased cortisol levels and lower heart rate in the group with the dog presence (Polheber & Matchock, 2014).

Only two studies were found that included the subject of mathematics and anxiety in the research. Few studies involving pet therapy were randomized or included a control and intervention group for college students. Animal-assisted therapy studies with nursing students were also minimal in the literature. The evidence supports the use of AAT as a method of stress reduction for a variety of groups. There is a gap in the literature where nursing students, animal-assisted therapy, and mathematics test anxiety are concerned and this study is significant for attempting to fill that void.

Method

This study evaluates an animal-assisted intervention using therapy dogs to determine if student anxiety due to a medication calculation exam decreases with exposure to the therapy dogs. The research questions are as follows: 1) Does exposure to therapy dogs prior to a medication calculation examination in a college nursing school effect student anxiety? 2) How do students perceive the therapy dog interaction? 3) Does animal-assisted therapy impact the students' medication calculation exam scores?

Design

This is an experimental study from a convenience sample using a pre-pre-post-post design and consists of an intervention and control group both randomly assigned. The independent variable is the use of a therapy dog intervention as an anxiety reduction method and the dependent variable is the students' anxiety level. Additionally, qualitative data is gathered through open-ended question survey; then interviews will be conducted in conjunction with statistically significant results from the quantitative anxiety testing.

Sampling

The participants for this study are a homogenous convenience sample (~20-22year old mostly females) from 125 nursing students at a small, private, university BSN program. The sample was divided into two groups with participants randomly assigned to an intervention group and a control or comparison group with anticipation of 90 participants that consent to the study. The findings of this study are generalizable only to this specific nursing student population. Intervention and control groups are divided by the last digit of the student identification number by odd and even; a coin flip determined that odd numbers were assigned to the control group and even numbers were assigned to the intervention group.

Demographic Information

Demographic information collected includes gender, age, ethnicity, level in school, if the student has been diagnosed with anxiety or other mental disorder and if so is he/she taking medication and when was it last taken, hours of sleep the night prior to the study, and if they own a pet or have ever owned a pet. The researcher considered including whether the student receives testing accommodations at this time or in the past in the demographic data; however, the sample size for this demographic would be a very small sample compared to the total sample and may cause false results. The demographic data is collected as part of the information for the student characteristics profile to identify future students that could potentially benefit from animal-assisted therapy or students that would be more successful without intervention. The demographic data is also collected to determine group differences among various demographic variables.

Instruments

Quantitative information was collected from the Spielberger State-Trait Anxiety Inventory Form Y (STAI). Form Y is the updated version from 1983 replacing the Form X due to the poor item analysis and improvement of the balance of anxiety present versus anxiety absent questions which finalized with 30% of the questions being replaced to produce Form Y. The STAI consists of 40 items with 20 items pertaining to state anxiety and 20 items measuring trait anxiety. The manual lists college students as a normative population for measurement. The STAI has good reliability and validity. The Cronbach's $\alpha = .91$ for males for state anxiety and .93 for females state anxiety. The Cronbach's $\alpha = .90$ for males for trait anxiety and .91 for females for trait anxiety. The test measures anxiety and has a two-factor structure (state and trait) and also has a four-factor structure (state anxiety present, state anxiety absent, trait anxiety present, and trait anxiety absent). State anxiety present factor is tested in questions #1, 3, 4, 6, 9, 11, 12, 13, 17, and 18 with reliabilities of .38 to .70 for each item; state anxiety absent factor is tested in questions #1, 2, 3, 5, 8, 10, 11, 15, 16, 19, and 20 with reliabilities of .54 to .71; trait anxiety present is tested in questions #7, 17, 25, 28, 29, 31, 32, 35, 37, 38, and 40 with reliabilities of .39 to .62; and trait anxiety absent is tested in questions #21-27, 30, 33, 34, 36, and 39 with reliabilities of .45 to .73 and one low item of .28.

The STAI can be taken electronically or paper/pencil and has ease of administration and scoring but should be referred to as 'self-evaluation questionnaire' when administering to avoid the term anxiety. The responses are on a Likert scale of 1 through 4 with 1=not at all, 2=somewhat, 3=moderately so, 4=very much so, and takes approximately 10 minutes to complete. Some examples from #1-20 questions testing 'how the person feels at that moment' for state anxiety are "I feel calm, I feel strained, and I feel content." Questions #21-40 are testing

'how the person generally feels' for trait anxiety and examples are "I feel pleasant, I feel nervous and restless, I feel secure, I feel inadequate." These questions are also a 4 point Likert scale with 1=almost never, 2=sometimes, 3=often, and 4=almost always. The scores range from 20 to 80 and the higher scores meaning the person has higher anxiety. The normative mean score for state anxiety is college males (M=36.47, SD=10.02); females (M=38.76, SD=11.95) and for trait anxiety is college males (M=38.30, SD=9.18); females (M=40.40, SD=10.15). For a one-hour retest reliability the trait anxiety for college males is r=.84 and females r=.76 and for state anxiety for males is r=.33 and females is r=.16. The lower retest scores are expected because state anxiety changes with each situation and does not produce consistent scores. The manual states retest is accurate in 1 hour to 240 days.

The STAI shows concurrent validity of correlation with the IPAT Anxiety Scale of .76 for males and .75 for females. The test also correlated with the Taylor Manifest Anxiety Scale at .79 for males and .80 for females. The overall total correlation for the three tests was .73 for males and .85 for females. Construct validity was measured using military scores as compared to working adult normal scores and college students tested in a normal setting, an exam setting, and a stressful movie setting (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

The 20 state and 20 trait anxiety questions were stratified into the four factors of state-present, state-absent, trait-present, and trait-absent; then the questions were randomly drawn and assigned to the pre-pre, pre, post, or post-post test. Each of the four tests had 10 questions measuring each of the four factors. The questions were pilot tested on a small group of 19-25 year-old males and females to determine if the distribution of the questions were logical, understandable, and fit with pre-pre, pre, post, or post-post testing. Four separate tests were created with the same instructions and Likert scale of 1 through 4 with 1=not at all, 2=somewhat,

3=moderately so, 4=very much so, as the original STAI. The study participants completed the tests by paper and pencil.

Additional qualitative information regarding the student perceptions of the experience was collected from the experimental subjects through 6 open-ended questions. Questions were:

1. As you were coming to take the exam today, how were you feeling?
2. Summarize your experience of visiting with the dog?
3. How did you perceive the interaction with the dog?
4. Explain your thoughts/feelings after the interaction with the dog.
5. What, if any, impact did the presence of the dogs have on your medication dosage calculation exam score?
6. In the future, what are your thoughts on having dogs available on campus?

The results of those questions were paired with the significant post-test scores on the STAI. Those students from the intervention group who show significant changes either positively or negatively on the STAI and/or those students whose answers to the open-ended questions stand out to the researcher will be asked to complete an interview focusing on the therapy dog interaction. A student profile was created of characteristics where a pet therapy program might be very beneficial to the student and also a profile of characteristics where the student would benefit more without a pet therapy interaction.

Consent

Following IRB approval at the author's educational and faculty work university, informed consent was obtained from students willing to participate in the study. If the study is found to be statistically significant and student anxiety is decreased from the pet therapy, the school administration is prepared to support a pet therapy program. Preliminary meetings with

the medical librarian for both the school and affiliated hospital have been promising for housing a pet therapy program in the library. There is a general informed consent for all participants at the pre-pre assessment, which also includes that all details of the study are not revealed and following the study a debriefing document explaining all details will be provided to each participant (Appendix A). The intervention group informed consent, completed at pre-assessment time interval, included questions for allergies to animals, fear of animals, and other serious health problems to screen for potential safety issues for participants (Appendix B). The control or comparison group informed consent completed at pre-assessment time interval included information about the self-evaluation questionnaire but not specific information about the animal-assisted therapy intervention (Appendix C). Following, the post-post assessment, the participants received a debriefing document explaining the details of the study that were not included in the original consent (Appendix D).

Procedure

This study aims to evaluate the relationship between AAT and student anxiety and determine in particular the effect of AAT on student test anxiety. During the Fall 2017 mid-semester, students were recruited in person by the researcher for the study. The students completed the general informed consent and the Spielberger State-Trait Anxiety Inventory (STAI) for pre-pre-test for baseline data at this time. After baseline data was collected, the students were randomly assigned into two groups. The students received a printed reminder the last week of the school semester to return on the first day of the next semester at the assigned time and to the assigned room prior to the medication calculation exam. The students also received two email reminders over the semester break to return to school early for their study participation.

Those students in the intervention group completed the intervention consent and the pre-test, and were offered coffee and donuts during this time in a room without the dogs present. Following completion of consent and pre-test, the intervention group study participants drew a colored marble from a container to randomize assignment into one of two rooms where the therapy dogs and their handlers were waiting; the participants completed an interaction with the therapy dogs for 35-45 minutes prior to medication calculation exam. The interaction was unstructured allowing the participants to pet the dogs, interact with each other and the handlers, and to study for the exam. Coffee and donuts were provided in each of the rooms with the dogs for the participants; as well as, wipes and hand sanitizer to use between petting the dogs and eating. The students completed the post-test STAI immediately following the interaction with the dogs in that same room; then completed the post-post test, the six qualitative questions, and the demographic data immediately following the medication dosage calculation exam.

There were eight dogs present with four in each room. The dogs arrived early and were in a room at the school of nursing separated from other contact except for the intervention group. Each dog had its own handler and was on a leash and under the handler's supervision during the time of the intervention. Each handler was responsible for the husbandry of his or her dog. Upon the completion of the intervention, each dog left with its handler.

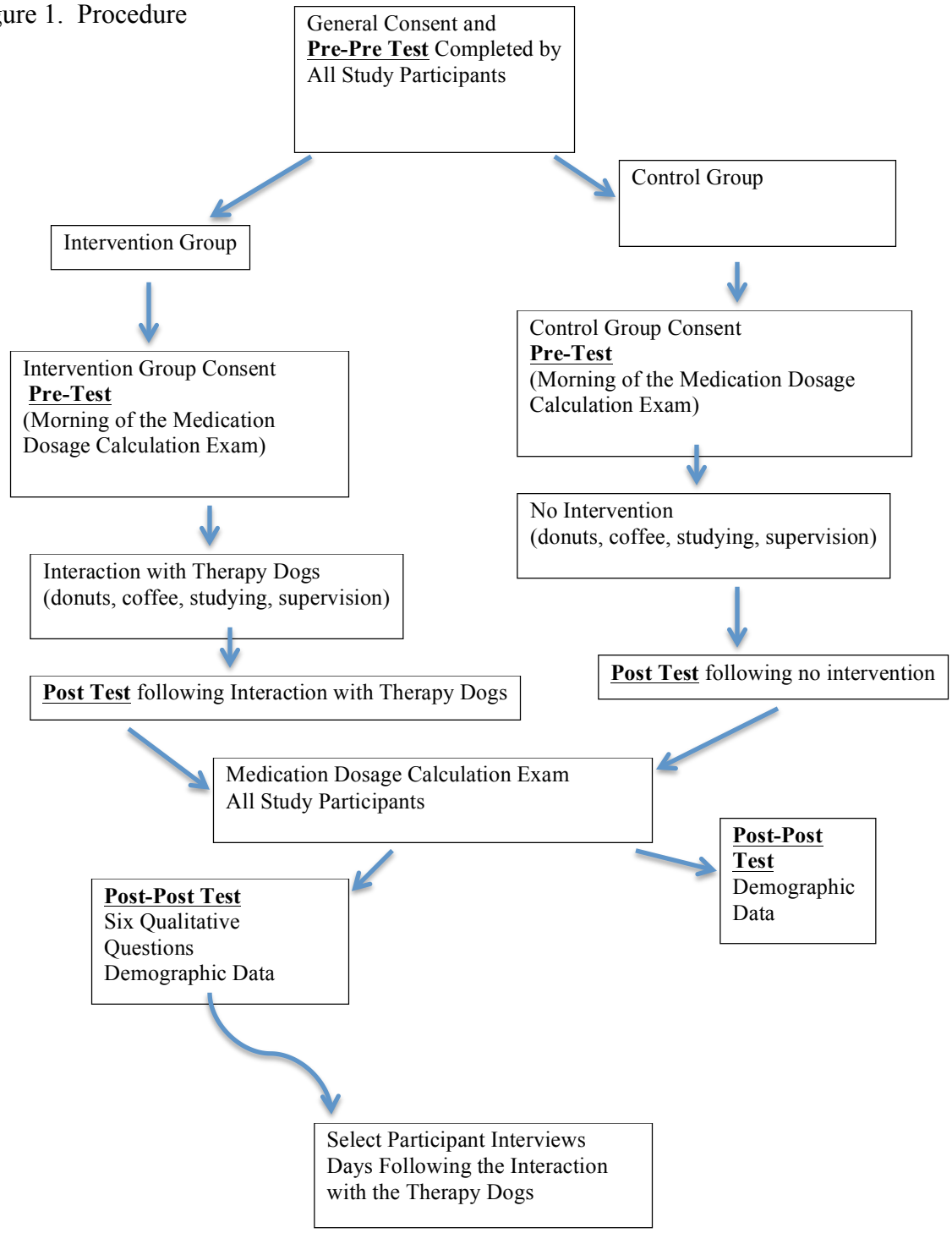
The therapy dogs were provided by Kansas Specialty Dog Service (KSDS) Assistance Dogs, Inc. KSDS Inc. is located in Washington, Kansas, and holds accreditation with Service Dogs International (KSDS Assistance Dogs, Inc., 2015). KSDS is also a Gold-level Guidestar Exchange participant for transparency (KSDS Assistance Dogs, Inc., 2015). These dogs are trained and certified as facility dogs or are puppies that are facility dogs in training and owned by KSDS (personal communication, Letha Nelson, KSDS Inc., July 2017).

The control group completed the pre-test STAI upon arrival the morning of the medication exam, then interacted with each other for 35-45 minutes in a separate and secluded room with coffee and donuts available. At the end of this time, the participants completed the post-test, and then completed the medication dosage calculation exam. All students completed the medication dosage calculation exam together. The control group participants completed the post-post STAI and demographic data immediately following the medication calculation exam. Interviews will be conducted after reviewing the open-ended question answers and reviewing the STAI data for students who show a marked decrease in anxiety through the STAI and also with some students who show no difference in test results or an increase in anxiety from pre to post.

The researcher recognizes a personal bias towards having therapy dogs available for students as the researcher agrees with the evidence from the literature that dogs increase quality of life, have a calming effect, and make people happier through interaction. Realizing that bias, the researcher took careful precautions not to interact with the study participants prior to the data collection when the therapy dog intervention was implemented. The researcher also recruited the efforts of the rest of the faculty from the school of nursing to refrain from mentioning therapy dogs or working to bring the dogs in prior to exams before the study was completed so the subjects would not be influenced by previous interactions or their own biases. Additionally, the researcher was not in the room with the intervention group the day of the therapy dog intervention when the consent was signed, the pre-test completed, the therapy dog interactions, or the post-test completed. The researcher was also not in the room with the control group when the consent, pre-test, or post-test was completed. There were two Baker School of Nursing faculty members with the intervention group and two with the control group who had received training from the researcher and step-by-step instructions on the implementation of the study for

the day of data collection. The handlers with the therapy dogs arrived to the rooms prior to the students arriving so there was not exposure to the dogs prior to the study implementation and data collection.

Figure 1. Procedure



Data Analysis

Data analysis was completed using SPSS software with a statistical significance alpha level of .05. Descriptive statistics were completed to summarize the demographic data; characteristics of the sample are demonstrated through mean, median, mode, and frequencies. To establish equivalence of baseline characteristics of the intervention and control group, chi-square was used for the discrete or categorical variables (gender, age, ethnicity, race, religion, level in school, anxiety, psychiatric diagnosis, and pet ownership) and an independent t-test was used for the continuous variable, hours of sleep the night prior to the data collection and medication calculation exam.

The first research question was addressed with the quantitative analysis. A Multiple Analysis of Variance (MANOVA) was conducted to evaluate for statistically significant differences between the intervention and control groups' STAI scores of the pre-test, post-test, and post-post test scores. The third research question was also addressed with quantitative analysis. An n-1 proportion test was conducted to determine if there was a statistically significant difference between the intervention and control groups' medication dosage calculation exam scores.

The second research question pertaining to the students' perception of the therapy dog interaction is addressed from the qualitative data. The open-ended questions were analyzed using categorized strategies of coding and thematic analysis. The interviews were not recorded for comfort level of the student subjects; detailed notes were taken of participant answers. The interview transcripts were coded into organizational and substantive categories of important information for the study. The organizational categories represent what the researcher wants to investigate and the substantive categories describe the participants' beliefs (Maxwell, 2013).

Qualitative research uses coding as the main strategy as this organizes the data into groups and from the categories the theoretical concepts emerge (Maxwell, 2013). Following the categorization of data, the researcher used connecting strategies to look for relationships between the qualitative data itself and the connection to the whole study purpose. Connecting strategies look for relationships from the statements and events within the context of the whole (Maxwell, 2013).

Maxwell (2013) says that validity for qualitative studies is shown as trustworthiness, authenticity, and quality; or how do the results stand against reality. The key concept in qualitative validity is the possibility of testing the accounts of the data against the world and that other hypotheses are not plausible (Maxwell, 2013). Researcher bias and reactivity by the participants from the researcher being present are two threats to qualitative validity; therefore, close attention is given to rich data, respondent validation (feedback from participants), intervention (considering the effect of the researcher's presence), discrepant evidence (does the information match and confirm your logic), triangulation (collecting information using a variety of methods), numbers (providing a more precise conclusion of behaviors), and comparisons (between the intervention and control group) to decrease threats to validity (Maxwell, 2013).

From the relationships a theory is concluded from the data about the study as a whole. Maxwell (2013) refers to generalizability in two realms—internal, within the group that is studied, and external, beyond that group that is studied to other persons or settings. The theory for this study is internally generalized to the specific nursing student population at the specific school where the study was conducted.

Results

A comprehensive database that included demographics, pre-pre, pre-, post-, and post-post questionnaire responses of the 90 subjects was developed. Accurate data entry was confirmed through examination of each data point twice by the researcher and an independent reviewer. Data were then analyzed using SPSS 23.0 statistical software.

Sample

130 students were approached for possible participation in the study during the Fall 2017 semester; 101 subjects agreed and were consented. Of the 101 consented subjects, subsequently 6 students were ineligible due to attrition from the School of Nursing, changing student status to part-time (would not be at the medication calculation exam the next semester), or non-advancement beyond first-level student status. On the day of the data collection, 5 eligible students did not participate in the study. Of the 101 subjects who consented during the Fall 2017, 90 of those subjects participated in the study on the first day of the Spring 2018 semester. Of the 90 subjects that participated, 1 subject did not complete the Post or Post-Post Test answering only 1 question in the state-anxiety question section; therefore, SPSS dropped that subject from analysis for those sections according to researcher entered rules into the software.

Table 1 details the descriptives and frequencies for the categorical variables of the characteristics of the sample for both the intervention and control groups. Crosstabs were conducted to determine if there were differences between the intervention and control groups. Table 1 contains a summary of the Chi Square tests for the categorical variables. The demographic data included gender, level in school, age range, religion, ethnicity, race, a diagnosis of anxiety and if there was a medication prescribed, a diagnosis of psychiatric disorder and if there was a medication prescribed, and if the participant ever owned a pet. For each of the

demographic categorical variables, the data analysis demonstrated no statistical significant difference between the intervention and control groups.

Table 1

Demographic Characteristics of Sample: Categorical Variables

Variable	Intervention (n=51) (n=42-46)	Control (n=49) (n=42-44)	Pearson		
	n(%)	n(%)	χ^2(df)	Phi	p-value
Gender			3.217(1)	.190	.073
Male	2 (4.4%)	7(15.9%)			
Female	43(95.6%)	37(84.1%)			
Level in School			3.471(2)	.196	.176
2	24(52.2%)	20(45.5%)			
3	9(19.6%)	16(36.4%)			
4	13(28.3%)	8(29.5%)			
Age			2.350(4)	.166	.672
20-22	28(65.1%)	28(66.7%)			
23-25	7(16.3%)	9(2.1%)			
26-30	5(11.6%)	4(9.5%)			
31-35	1(2.3%)	1(2.4%)			
36 or >	2(4.7%)	0(0%)			
Religion			2.422(2)	.169	.298
Christian	39(90.7%)	33(78.6%)			
Atheist	1(2.3%)	2(4.8%)			
Other	3(7.0%)	7(16.7%)			
Ethnicity			1.012(1)	.110	.314
Hispanic	1(2.4%)	0(0%)			
Non-Hispanic	41(97.6%)	42(100%)			
Race			4.001(3)	.217	.261
African American	1(2.3%)	1(2.4%)			
Asian	2(4.7%)	0(0%)			
Caucasian	40(93.0%)	39(92.9%)			
Diagnosis					
Anxiety	13(30.2%)	17(40.5%)	.976(1)	-.107	.323
Medication Rx	7(53.8%)	11(64.7%)	.362(1)	-.110	.547
Psychiatric (e.g.: depression, ADHD)	9(20.9%)	14(33.3%)	1.656(1)	-.140	.198
Medication Rx	3(33.3%)	8(57.1%)	1.245(1)	-.233	.265
Owned a Pet	41(95.3%)	39(92.9%)	.238(1)	.053	.625

An independent t-test was conducted to determine if there was a difference in hours of sleep the night prior to the test between the intervention and control groups. Table 2 shows a summary of the t-test for this continuous variable. There was not a statistical significant difference in the hours of sleep the previous night between the two groups.

Table 2

Demographic Characteristics of the Sample: Continuous Variable

Variable	Intervention (n=43)	Control (n=42)		
	M ± SD	M ± SD	t(df)	p
Sleep	6.73 ± 1.38	6.50 ± 1.10	.860(79.99)	.392

All demographic data shows there are no statistical differences between the intervention and control group; therefore, establishing equivalence between the groups.

Instrument

Spielberger's State-Trait Anxiety Inventory (STAI) was used for this study. There are 20 questions measuring two factors of state anxiety present and not present; and there are 20 questions measuring trait anxiety present and not present. The Cronbach's $\alpha = .91$ for males for state anxiety and .93 for females state anxiety. The Cronbach's $\alpha = .90$ for males for trait anxiety and .91 for females for trait anxiety. Using the Spearman Brown Prophecy formula the estimated Cronbach's α for the original STAI if the number of questions was decreased to be comparable to the 10 questions on each of the STAI the students completed is: for state anxiety .717 for males and .769 for females; for trait anxiety .692 for males and .717 for females.

The subjects completed the STAI three times the day of the data collection for the study, prior to and after the medication dosage calculation exam. "…[T]aking the same test repeatedly could influence subjects' responses the next time the test is completed (LoBiondo-Wood & Haber, 2014, p. 173). To avoid any threat to internal validity, the subjects were not given the

same question twice by completing the 10 question tests described in the instrument methodology. The reliability study for the four tests is shown in Table 3.

Table 3

Reliability Analysis Spielberger State-Trait Anxiety Inventory (STAI) (N=89-90)

Variable	*M* ± *SD* (Range)	Cronbach α
State Anxiety		
Pre-Pre Test	10.61 ± 2.80 (5-20)	.706
Pre-Test	10.46 ± 3.14 (5-20)	.799
Post-Test	10.85 ± 3.50 (6-24)	.838
Post-Post Test	8.45 ± 3.96 (4-16)	.900
Trait Anxiety		
Pre-Pre Test	9.49 ± 2.57 (5-20)	.724
Pre-Test	10.72 ± 2.76 (5-20)	.721
Post-Test	8.03 ± 1.89 (4-16)	.549
Post-Post Test	11.77 ± 3.36 (6-24)	.827

Research Question 1

The data from all four STAI tests completed by the study participants was analyzed using a one-way multivariate analysis of variance (MANOVA) to determine the effect of the independent variable of the interaction with the therapy dogs on the dependent variables of state and trait anxiety. Table 4 shows a summary of the comparison. Baseline state-anxiety data was collected for the Spielberger State-Trait Anxiety Inventory (STAI) in October during the Fall 2017 semester as a Pre-Pre Test and then as a Pre-Test, Post-Test, and Post-Post Test on the first day of the Spring 2018 semester the morning of the medication dosage calculation exam.

Table 4

One-Way Multivariate Analysis of Variance (MANOVA) for State and Trait Anxiety

Variable	Intervention (n=45-46) Mean (±SD) (Range 1-4)	Control (n=44) Mean (±SD) (Range 1-4)	Wilk's Λ	F(df)	p
Multivariate			.761	3.103(8)	.004**
State Anxiety					
Pre-Pre	2.04 ± .55	2.18 ± .54			
Pre	2.08 ± .68	2.06 ± .55			
Post	1.60 ± .50	2.03 ± .58			
Post-Post	1.97 ± .97	2.26 ± 1.00			
Trait Anxiety					
Pre-Pre	1.81 ± .50	1.98 ± .53			
Pre	2.11 ± .50	2.17 ± .61			
Post	1.88 ± .40	2.13 ± .50			
Post-Post	1.88 ± .50	2.04 ± .61			
Univariate					
State Anxiety					
Pre-Pre				1.505(1)	.223
Pre				.042(1)	.837
Post				14.031(1)	.000***
Post-Post				3.020(1)	.086
Trait Anxiety					
Pre-Pre				2.381(1)	.126
Pre				.249(1)	.619
Post				6.647(1)	.012*
Post-Post				2.012(1)	.160

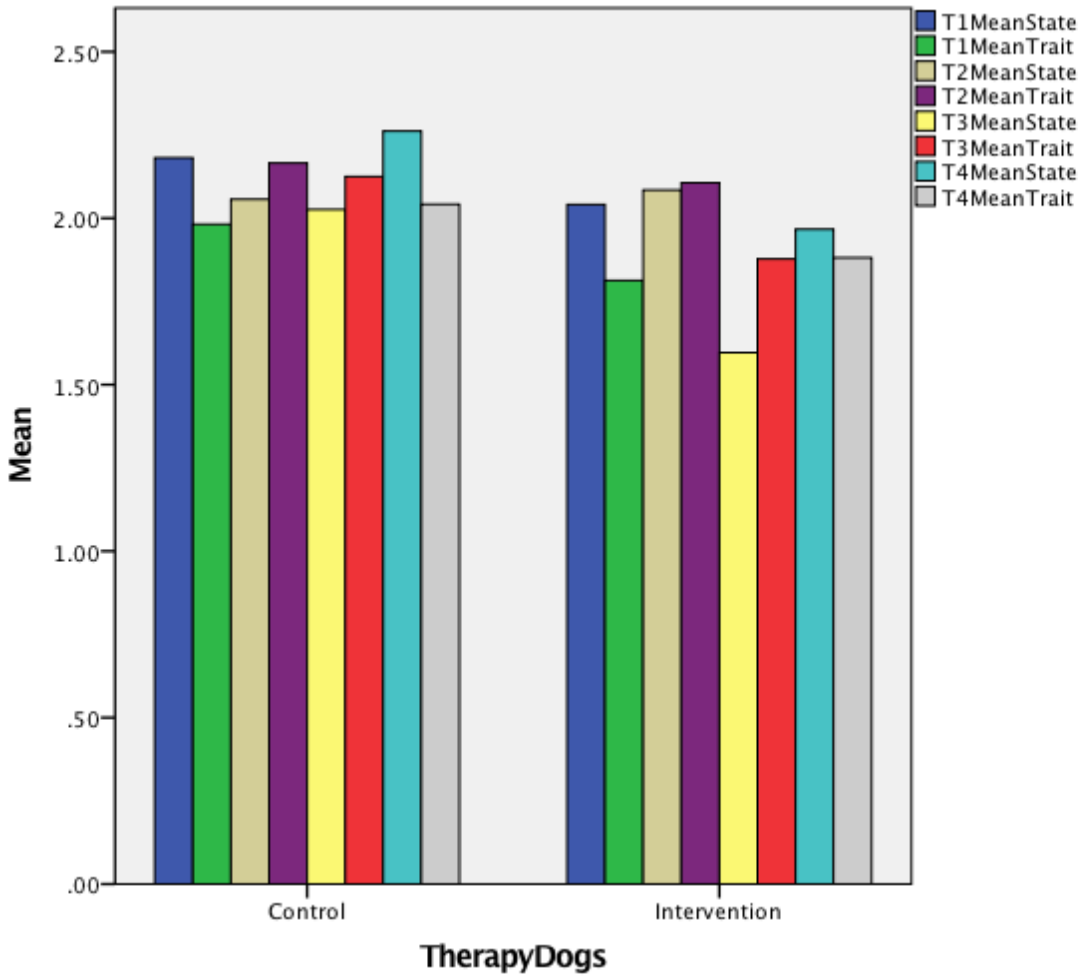
Note. * Significant at $p < .05$. ** Significant at $p < .01$. *** Significant at $p < .001$.

Figure 2 illustrates the differences between the intervention and control groups at the four separate times the STAI was completed by the study participants. The T1MeanState and the T1MeanTrait is the data from the Pre-Pre Test. The T2MeanState and T2MeanTrait is the data from the Pre-Test. Both of these times were not statistically significant and the blue, green, beige and purple columns show the almost even levels of the intervention and control groups. The statistically significant T3MeanState and T3MeanTrait Post-Test results, easily recognized by the difference in height of columns, are shown in the yellow and red columns at the time of

the Post-Test. Although the T4MeanState and T4MeanTrait of the Post-Post Test were not significant, the blue and gray column heights of the intervention group are lower than those of the control group.

Figure 2.

Comparison of STAI Mean Scores



Research Question 2

Six open-ended qualitative questions were asked of the intervention group at the end of the post-post test and prior to the collection of demographic data. The data for each question was compiled and analyzed looking for themes. The data were also peer-reviewed by three other

faculty, 2 PhD (1 in Nursing and 1 in Education) and 1 Master of Science in Nursing (MSN), at the University School of Nursing. The peer reviewers were asked to assess the data for themes highlighting "like or same" ideas and to summarize findings. The significant findings were identified through categorizing and then finding the themes in the answers to the questions. Then, interviews of subjects were completed for the most negative and the most positive answers to the questions. There were two students who did not complete the qualitative information questionnaire in the intervention group (n = 44).

The organizational categories were student feelings prior to the medication dosage calculation exam, perceptions of the experience with the therapy dogs, if the students perceived there was an impact on their medication dosage calculation exam scores, and if the subjects found the therapy dogs useful enough to arrange for future visits. The first question asked the subjects how they felt coming in that day prior to taking the medication dosage calculation exam. The main theme showed the majority of the students were anxious or nervous the morning of the exam. Other students were confident or felt prepared for the exam. Three students reported they were not prepared because they had not studied enough for the exam.

In substantive categories of the experience with the dogs, the majority of students said the dogs were calming, relaxing, put them at ease and they loved the interaction. Of that majority, four students were self-proclaimed "dog lovers." The subjects' perception of the therapy dog interaction showed themes of calming, relaxing, comforting, happy, exciting, fun, and good. The majority of the subjects determined that after they interacted with the dogs, they were more calm and relaxed and felt better than prior to the interaction. One student wrote "it was like a dream ☺ so happy." The substantive category of the impact on exam scores showed about one-half of

the participants felt like the interaction with the dogs prior to the exam had a positive impact on their medication dosage calculation scores.

There were five students who, although enjoyed the experience with the majority, additionally felt like the length of time for the interaction was too long and they felt like they should have been studying for the exam or lost focus of the exam. Approximately seven people said they were still anxious or had no change in feelings after the interaction. And about one-half of the intervention group felt like there was no change to their exam scores after the therapy dog interaction. There were two students who wrote they did not like dogs. Two others felt like the dog hair they got on their clothes produced more anxiety than the exam itself. There were three subjects who said it "was not their thing" and did not like the interaction. One subject felt like the therapy dog interaction had a negative impact on his or her score because it was the first failure and also the first time he or she had experienced the dogs.

The final question for the study asked if there should be dogs available on campus in the future. The substantive category showed every single intervention group study participant was in favor of bringing dogs to campus and having them available; with the majority feeling that on a regular basis would be beneficial and a few who felt especially for test days the dogs were needed. There were five comments saying the dogs did not really help that subject individually, but he or she could see that it helped others and understood it would be a positive impact for the students.

For respondent validation, discrepant evidence, and triangulation of the data, 10 study participants were asked for follow-up interviews based on strong statements in their qualitative questions. There were five study participants who answered the request to complete an interview; four of those participants followed through for the interview. Interviews were

completed from the significant findings in the open-ended questions. The participants with the most positive and the most negative answers were asked to be interviewed in the days following the experience of interacting with the therapy dogs. The questions were:

1. Why did or didn't the dogs help you?
2. What do you usually do to relax prior to a test? Does it work?
3. How do you study? When do you study?
4. What would you utilize instead of the dogs? What would help you relax?
5. Do you usually pass the medication dosage calculation exam the first time?
6. Is nursing school more or less stressful than other school you have completed?

The interview findings were as follows:

Addison: This study participant felt like the dogs were not helpful because they created anxiety for her due to the dog hair on her clothing. She self-reports she is not a big dog person because she worries too much about the hair. She says she is confident in "math" as she was a tutor in previous semesters for the medication dosage calculation exam and would not necessarily come early to see dogs prior to the exam. She reports that "diffusing scents would be more helpful" for her and would like to see a future study researching this as an anxiety reducer or she "loves fidget things like silly putty" which she could also see as part of a study. She also discussed that she only completed one example from each type of practice problem to study prior to the exam. She normally studies on her own and then seeks out a study group of friends to study but mainly tries to put concepts together. Addison expresses that nursing school is more stressful than other school she has completed because of the time commitment of being at school many more hours than at home. Also, she has to do more studying at school and she is in 4th level which is frantic most of the time because of the amount of work.

Chelsea: This study participant reports that she was anxious the morning of the study and is usually anxious prior to exams as she has testing accommodations and tests in a quiet environment separate from the main class. She self-reported the interaction with the dogs helped her to think about something other than the test because at that point "you're gonna know what you know" and there was "no freaking out or panicking right before the test." Chelsea says sometimes she takes deep breaths to help herself relax prior to exams, but mostly she tried to prepare ahead of time and does not cram. She reports the dogs were "awesome" and they impacted her to be "calmer going in it; I didn't have to talk to peers" as sometimes peers make her "stressed out" and in this scenario she could "pet and talk to the dog" rather than interact with her peers. She feels like the dogs would mainly be helpful before exams; the only other suggestion she had that could help students would be offering healthy snacks during final exam week. Chelsea expresses she loves animals; they make you happy; and the hair does not bother her. She feels like nursing school is more stress than any other school she has completed as it is different because there are "higher stakes" and she has to "know how to take care of people" so she needs to success and do well. With this in mind, she requested dogs be present prior to midterms and finals because they were beneficial; in fact, she truly feels like the dogs helped her get a perfect score on her medication calculation exam.

Susan: This study participant reports that the dogs made her "super happy" and "more relaxed" as she was "super stressed" coming in that morning prior to the exam. She said it is stressful when the semester is first starting because the students don't know how things will work yet. She reports the dogs were relaxing because "dogs don't have to worry" and the dogs "knew how to interact and behave and know how to help because they are trained." Susan self-reports she does not usually do anything specific to relax as she usually just says "go for it" and

thinks she will “see what happens” prior to testing so she feels like “dogs are a good option to go with” for relaxation. She would like to see the dogs in the school a couple times a week in the commons area where students could interact with them between classes. Susan does study early “ahead of time” to be prepared for tests. She also studied that morning through reviewing with peers as she interacted with the dogs but there was not much talk about the exam rather the talk pertained to the dogs and the handlers. Susan believes nursing school is more stressful than other school she has completed due to the “amount of content” and a “whole new way of thinking” with “more in-depth questions” for tests; then when clinical is added and she needs to know the content and how to apply rather than memorizing.

Lanaya: This study participant loved the interaction with the dogs but felt like it was a big too long and should only be about 30-minutes long. She reports she hates dog hair but there was a non-shedding poodle there that she enjoyed petting. She has never had test anxiety but does have anxiety and takes a prescription for that diagnosis. When she studies she prepares a study guide ahead of time and then crams using quizlet immediately prior to the exam. However, at the 30-minute mark prior to any exam she “just wants to get it done.” She does not use an alternate method of relaxation; although, she admits her Mother tries to have her use essential oils and other classmates use essential oils, but she is “not sure [she] buys into it.” She reports that nursing school is stressful but good because she has a personal relationship with faculty and wants to do well for them, as well as herself. She discusses that she came from a small high school and did not know how to study when she arrived at KU but learned that and has a 4.0 GPA in nursing school. She also reports she is a person who makes sure to get enough sleep to keep the stress at bay. She requests the dogs be available throughout the week where she could visit as she wished but not necessarily prior to an exam.

The prevailing themes of the interviews were that nursing school was more stressful than other schools they had encountered and the therapy dogs were helpful to their psyche. All of the interviewees study ahead of time to prepare for exams but two of them like to study immediately prior to exams also. Two of the interview participants were concerned with the dog hair on their clothing. Two of the interview participants believed the dogs helped increase medication dosage calculation scores. Three of the four interview participants enjoyed the dogs, felt like the dogs calmed and relaxed them, and would utilize them if they were available during the week or prior to exams.

Research Question 3

An n-1 two-proportional test using a two-way contingency table was conducted to evaluate whether the interaction with the therapy dogs had an impact on the medication dosage calculation exam scores of the students. Table 5 is a summary of the first-time pass rates for each of the three levels and also for the total of study participants.

Table 5

Medication Dosage Calculation Exam First Time Pass Rate (N=89)

Variable	Intervention n(%)	Control n(%)	Pearson χ^2(df)	Cramer's V	p
Level 2			1.104(1)	.158	.293
Passed	20(83.3)	14(70)			
Failed	4(16.7)	6(30)			
Level 3			.336(1)	.118	.562
Passed	7(77.8)	10(66.7)			
Failed	2(22.2)	5(33.3			
Level 4			.359(1)	.131	.549
Passed	3(23.1)	1(12.5)			
Failed	10(76.9)	7(87.5)			
Total (all levels)			.472(1)	.073	.492
Passed	30(65.2)	25(58.1)			
Failed	16(34.8)	18(41.9)			
Total (Levels 2 & 3 only)			1.590(1)	.153	.207
Passed	27(81.8)	24(68.6)			
Failed	6(18.2)	11(31.4)			

Discussion

This study evaluated an animal-assisted therapy intervention using exposure to and interaction with therapy dogs to determine if nursing student anxiety at a small, private, Baccalaureate University decreased prior to a medication dosage calculation exam. The research questions asked if exposure to the therapy dogs decreased anxiety prior to the exam, the students' perception of the therapy dog interaction, and if the therapy dog interaction affected the students' exam scores.

Sample

The study participants were randomly distributed between the intervention and control groups. The intervention and control groups had no significant differences between their memberships. The sample demographics for the study show equivalence of the intervention and control group in age, gender, ethnicity, race, gender, anxiety diagnosis, anxiety medication prescribed, psychiatric diagnosis, psychiatric medication prescribed, pet ownership, and hours of sleep the night prior to the exam. The study participants (N=90) were predominantly female, age 20 – 22 years of age, Caucasian, Christian, owned a dog, and slept approximately 6.5 hours the night prior to the medication dosage calculation exam. Thirty-three percent of the study participants had a diagnosis of anxiety and 25.6% had a psychiatric diagnosis (e.g.: depression, ADHD). Table 1 shows the summary of the Chi-square results for the categorical variables. Table 2 shows the independent t-test results for the continuous variable of hours of sleep.

Research Question 1

The first research question asked if student anxiety was affected by exposure to therapy dogs prior to a medication dosage calculation exam. The quantitative data from the four separate STAI tests were analyzed to answer this question. The data measured both state and trait anxiety

for an intervention (n = 45) and control (n = 44) group at a Pre-Pre Test to establish a baseline and determine if the two groups were equivalent in membership. Then state and trait anxiety were collected at a Pre-Test when the participants first arrived prior to the interaction with the therapy dogs the morning of the medication dosage calculation exam. Immediately following the interaction with the therapy dogs the Post-Test state and trait anxiety data was collected. Then the Post-Post test data was collected immediately following the medication dosage calculation exam. The control group completed the four state and trait anxiety tests at the same timeframes without the intervention of the therapy dogs.

To evaluate the STAI data, a MANOVA was conducted and determined there was a statistically significant difference between the state and trait anxiety of the intervention (n = 45) and control groups (n = 44) Wilk's $\Lambda = .761$, partial $\eta^2 = .239$, $F(8,79) = 3.103$, $p < .01$. The MANOVA demonstrates there was a difference between the anxiety levels of the intervention and control groups. As part of the multivariate profile analysis, the Univariate analysis shows the one-way Analysis of Variance (ANOVA). The results of the Univariate between-subjects tests determined a statistically significant difference for both state $F(1,86) = 14.031$, $p < .001$, partial $\eta^2 = .140$,and trait $F(1,86) = 6.647$, $p = .012$ anxiety between the intervention and control groups at the time of the Post-Test which was immediately following the interaction with the therapy dogs. This difference demonstrates the decrease in anxiety of the intervention group as compared to the anxiety of the control group immediately following the interaction with the therapy dogs and prior to the medication dosage calculation exam. The Post-Test was the statistically significant test for the intervention and control STAI results; the Pre-Pre, Pre, and Post-Post Tests determined non-significant differences between the intervention and control groups. The significance of the interaction with the dogs did not have a lasting effect past the

medication dosage calculation exam. The therapy dog interaction did make a difference in decreasing the students' anxiety prior to the exam; thus, demonstrating evidence of a being beneficial to students to interact with therapy dogs prior to the medication dosage calculation exam.

Research Question 2

For this study, there is internal generalizability that applies to the students at the school of nursing. Using the qualitative feedback from the participants in the intervention group who experienced the interaction with the therapy dogs is necessary to determine the participants' perceptions of the experience of the intervention. The qualitative data demonstrated the major theme of the intervention group perception was the interaction of the therapy dogs was calming and relaxing; thereby, decreasing the anxious feelings they had prior to the interaction with the dogs. The data showed that students felt more relaxed to focus on the medication dosage calculation exam. The students who reported positive results from the therapy dog interaction all requested that dogs be available on campus in the future.

For those few subjects who did not enjoy the experience of the dogs, they contributed their dislike of the situation to dog hair on their clothing, length of time of the intervention, and lack of study time prior to the exam. Even so, where subjects were not fond of the experience with the dogs, the subjects wrote that they "could see that other students really enjoyed the dogs" and "could see they were helpful" to the students. Of those subjects who had negative comments about the experience, every subject wrote they could see the positive impact the dogs had on the rest of the participants and that the entire student body would benefit from having dogs on campus.

In addressing the first-time pass rate for the medication dosage calculation exam scores, the majority of the students expressed either the dogs had no impact or did not know if the interaction impacted their score. This perception was solidified through the evidence of the first-time pass rates shown in Table 5 where statistical significance was not found between the intervention and control groups on the exam scores. However, there were some students from the qualitative question data who reported the interaction with the dogs positively affected their scores and possibly even helped them pass the exam. During the follow-up interviews there were students who said they "truly believed the dogs helped [them] pass" the exam the first time or that the dogs "positively impacted" their scores.

Aggregating the study participant answers to the qualitative questions and the information from the interviews, the data was categorized and themes emerged showing study participants either had strong positive or negative feelings about the interaction with the therapy dogs. There were also undecided or mediocre responses to the intervention. This information is helpful as it lends to the development of the student profile for someone benefiting from the exposure to the therapy dogs or someone who would benefit from an alternate relaxation intervention.

Research Question 3

During the medication dosage calculation exam, an inadvertent stressor became apparent. The 4th level students were not allowed equal time as the 2nd and 3rd level students; there was a 30-minute time limit accidentally attached to the 4th level exam and no time limit attached to the other student levels. The Level 4 study participant first-time pass rate was much lower (19%), than either Level 2 study participants (77%) or Level 3 study participants (50%) first-time pass rate. Each level was analyzed using the n-1 two-proportion test; each level was analyzed

separately to account for the time-limit and decreased first-time pass rate of the Level 4 participants.

There was not a statistically significant difference when looking at each of the levels for the first time pass rate for the intervention and control groups for Level 2, Pearson χ^2 (1, N = 44) = 1.104, p = .293, Cramer's *V* = .158; Level 3, Pearson χ^2 (1, N = 24) = .336, p = .562, Cramer's *V* = .118; or Level 4 Pearson χ^2 (1, N = 21) = .359, p = .549, Cramer's *V* = .131. The total group of study participants was not significantly affected by the therapy dog interaction as well Pearson χ^2 (1, N = 89) = .472, p = .492, Cramer's *V* = .073.

The last two years of data from the medication dosage calculation exam each semester show a 76.47% first time pass rate. Although the results were not statistically significant between the intervention and control group for first-time pass percentage, there were still some interesting aspects of the data analysis to be addressed. Level 2 intervention group subjects experienced an 83.3% and Level 3 intervention group subjects experienced a 77.8% first-time pass rate, which is higher than the historical 76.47% rate. Therefore, the question of the impact of the interaction with the therapy dogs on the first-time pass rate may need further investigation and judgment may be suspended from these results.

Conclusion

This study used a convenience sample to explore the effect of animal-assisted therapy on nursing student anxiety prior to a medication dosage calculation exam at a small university, baccalaureate-nursing program. The researcher found few studies specifically involving animal-assisted therapy with nursing students or that were experimental randomized control studies for nursing students. This study's participants are nursing students and although it is a small convenience sample the participants were randomized into an intervention and control group.

This adds valuable and empirical knowledge to the field of animal-assisted therapy and to the field of nursing student anxiety and coping methods. This study provides evidence on an experimental basis that therapy dogs decreased anxiety in a nursing student sample, Wilk's Λ = .761, $F(8,79) = 3.103$, $p < .01$, prior to a medication dosage calculation exam. There was a statistically significant difference between intervention and control group anxiety levels after the exposure to therapy dogs demonstrating students' state $F(1,86) = 14.031$, $p < .001$ and trait $F(1,86) = 6.647$, $p = .012$ anxiety scores were decreased significantly after the interaction with the therapy dogs prior to the medication dosage calculation exam.

Additionally the qualitative questions determined that the students predominantly enjoyed the experience with the dogs and perceived the dogs had a calming and relaxing effect on their outlooks prior to the medication dosage calculation exam. Participant qualitative data was unanimously in favor of having dogs available on campus both on a regular basis and prior to exams as a method of stress relief. Even students who self-reported they would not use the service themselves felt that dogs would benefit the student body as a whole and understood the need for some students to have the dogs to decrease anxiety.

There was not a significant difference between the intervention and control groups', Pearson χ^2 (1, N = 89) = .472, p = .492, Cramer's $V = .073$, first-time pass rates for the medication dosage calculation exam. Even so, there were some students who perceived that the dogs had a positive impact on their medication dosage calculation scores. Through the qualitative questions and follow-up interviews it was evident that there were students who believed the interaction with the dogs actually helped them to pass the exam. Perception of the subject participants was that the therapy dog interaction was beneficial even though this was not reflected in the first-time pass rate of the exam. Providing dogs to the student body prior to the

medication dosage calculation exam was psychologically helpful, shown with the STAI scores and the qualitative information, even if the medication dosage calculation scores were not affected.

Through the multiple methods of data collection, it is evident that nursing students from this baccalaureate school of nursing benefit from animal-assisted therapy prior to a medication dosage calculation exam. The quantitative data determined there was a statistically significant difference in the anxiety level decreasing in the intervention group as compared to the anxiety level of the control group. The open-ended qualitative question data echoed this evidence. The interviews of the specific students added to the data of the benefits of the therapy dog interaction.

Using the triangulation of the data, quantitative STAI scores, qualitative questions, and participant interviews from this study, a student profile of who would benefit from animal-assisted therapy and a student profile of who would not benefit from the therapy was identified. The students who would benefit from a therapy dog are those who enjoy dogs, are anxious prior to the medication dosage calculation exam, study on a regular basis rather than cramming, do not want to discuss the material with peers immediately prior to the exam, and do not utilize another method of relaxation to decrease anxiety. The students who would not benefit from an interaction with a therapy dog prior to the medication dosage calculation exam are those who may like dogs but get anxiety from having dog hair on their clothing or do not like dogs, are confident in their mathematics skills and do not have anxiety prior to testing, want to study until the last minute prior to the exam, and use other means of relaxation (e.g.: fidget spinners, essential oil diffusion, peer study group) to decrease anxiety.

The literature provides evidence that nursing students experience high levels of stress during school in their coursework and also during clinical practice (Jimenez et al., 2010; Prato &

Yucha, 2013; Reeve et al., 2013). This stress was echoed in the interviews where students verbalized they had never before experienced such high stress levels during school. The students reported the high stress was due to high expectations of self. Also they felt the pressure of expectations from others because as nurses they would need to know information and how to apply it rather than learning it primarily for coursework.

One interviewee named peer interactions prior to testing a stressor. Polheber and Matchock (2014) also found study participants were more comfortable completing a mathematics calculation with a dog present rather than a friend in the room. The interviewee for this study felt like it was more relaxing and calming to interact with the therapy dogs rather than her peers prior to the medication dosage calculation exam. The interviewee named peer interaction as a stressor because she tried to prepare in advance and did not study last minute so going over information with peers prior to exams created more anxiety and self-doubt for her. Coincidentally, the interviewee was also a person who had testing accommodations, which may help to give more clarity to the benefits of animal-assisted therapy for certain student profiles.

When a person feels stress from the environment, the person completes a primary appraisal to determine if the event will cause harm or loss, is neutral and does not effect him or her, or if the event will have a positive outcome (Folkman, 1984; Folkman & Lazarus, 1985, 1988, Lazarus & Folkman, 1984a, 1987). When the subject participants completed the appraisal of the medication dosage calculation exam, it was seen as a threat because of the possibility of failing the exam, which would not allow them to continue on to their clinical courses until passing one of two chances to retake the exam. If the student fails the exam, there is harm or loss, as in the TTS, because there is the task of attempting to pass another exam or if the student is unable to pass the exam then there is no advancement to clinical courses.

The open-ended questions and the pre-test scores determined the majority of students were anxious coming in the morning of the study prior to the medication dosage calculation exam. As with the TTS, the primary appraisal of students was the fact that there was an exam and the secondary appraisal showed the students perceived the exam as a threat to their person. Therefore, the students' coping mechanisms started to work as the subjects dealt with the threat. There are many ways to deal with a threat and sometimes the stressor relationship is not a healthy one. For example, students might choose unhealthy choices of overeating, under eating, alcohol, or drugs. Students used their lines of resistance as in the NSM to cope with the exam threat. Some students admittedly had weakened lines of defense, due to anxiety stemming from the anticipation of the medication dosage calculation exam. The interaction with the therapy dogs assisted with the coping process found in the TTS. The therapy dogs decreased the reaction to the perceived threat because the study participants saw the dogs as a comfort and a stress reliever. The therapy dogs served as a way to maintain homeostasis and preserve the lines of resistance to stress as in the NSM.

This study's significance gives evidence to the need for BSN programs to support their students with safe coping methods. Therapy dog interaction prior to testing gives the students a stress reliever that could decrease anxiety; thereby, producing a student whose stress relationship with testing was not seen as such a threat. The therapy dog interaction would change the way students saw the relationship with the exam, and give some students a better way to cope. Especially students, who enjoy dogs, have the potential to be more anxious than others, and believe the interaction might positively affect exam scores. The exam scores for this study were not affected but clearly the anxiety level was decreased after the subject participants interacted with the therapy dogs. The decrease in the anxiety demonstrates goal attainment of assisting in

maintaining lines of defense and reducing the stressor relationship of seeing the exams as a threat.

Limitations

The limitations to the study include the convenience sample and small sample size so the research will be internally generalizable to the students in this nursing school rather than all nursing students or college students. An additional limitation includes that the students self-selected to the study although they were not aware of the nature of the study prior to the intervention implementation.

Recommendations for Future Studies

Future research would be beneficial in this area as there are a limited number of studies with empirical information for animal-assisted therapy with nursing students. A consideration for future research is a study with a larger sample size or across multiple campuses, so there is more opportunity for generalization within the nursing student population as a whole. Schools could potentially provide animal-assisted therapy at a low cost to the school and high return rate for student satisfaction. The reputation and effects of student satisfaction with an AAT program could positively impact a nursing school's enrollment. Both the student and nursing school have the potential to benefit from an AAT program.

References

American Pet Products. (2016). U.S. pet industry spending figures & future outlook. Retrieved from www.americanpetproducts.org/press_industrytrends.asp

Bagnasco, A., Galaverna, L., Aleo, G., Grugnetti, A. M., Rosa, F., & Sasso, L. (2016). Mathematical calculation skills required for drug administration in undergraduate nursing students to ensure patient safety: A descriptive study drug calculation skills in nursing students. *Nurse Education in Practice*, *16*, 33–39.

Barker, S. B., Barker, R. T., McCain, N. L., & Schubert, C. M. (2016). A randomized cross-over exploratory study of the effect of visiting therapy dogs on college students stress before final exams. *Anthrozoos*, *29*(1), 35–46. https://doi.org/10.1080/08927936.2015.1069988

Barker, S. B., Knisely, J. S., McCain, N. L., Schubert, C. M., & Pandurangi, A. K. (2010). Exploratory Study of Stress-Buffering Response Patterns from Interaction with a Therapy Dog. *Anthrozoos*, *23*(1), 79–91. https://doi.org/10.2752/175303710X12627079939341

Baumgartner, E., & Cho, J. (2014). Animal-assisted Activities for Students With Disabilities. *Childhood Education*, *90*(4), 281–290.

Behling, R. J., Haefner, J., & Stowe, M. (2011). Animal Programs and Animal Assisted Therapy in Illinois Long-Term Care Facilities Twenty Years Later (1990-2010). *Academy of Health Care Management Journal*, *7*(2), 109–117.

Bell, A., allison.bell@utoronto. c. (2013). Paws for a Study Break: Running an Animal Assisted Therapy Program at the Gerstein Science Information Centre. *Partnership: The Canadian Journal of Library & Information Practice & Research*, *8*(1), 1–14.

Binfet, J.-T., & Passmore, H.-A. (2016). Hounds and homesickness: The effects of an animal-assisted therapeutic intervention for first-year university students. *Anthrozoos*, *29*(3), 441–454. https://doi.org/10.1080/08927936.2016.1181364

Bradley, T., & King, R. (2012). The dog economy is global--but what is the world's true canine capital? *The Atlantic*. Retrieved from www.theatlantic.com/business

Calcaterra, V., Veggiotti, P., Palestrini, C., Giorgis, V. D., Raschetti, R., Tumminelli, M., … Pelizzo, G. (2015). Post-Operative Benefits of Animal-Assisted Therapy in Pediatric Surgery: A Randomised Study: e0125813. *PLoS One*, *10*(6). https://doi.org/http://dx.doi.org/10.1371/journal.pone.0125813

Cangelosi, P. R., & Sorrell, J. M. (2010). Walking for Therapy with Man's Best Friend. *Journal of Psychosocial Nursing & Mental Health Services*, *48*(3), 19–22.

Carlisle, G. K. (2014). The Social Skills and Attachment to Dogs of Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *45*(5), 1137–1145. https://doi.org/10.1007/s10803-014-2267-7

Chandler, C. K., Portrie-Bethke, T. L., Barrio Minton, C. A., Fernando, D. M., & O'Callaghan, D. M. (2010). Matching Animal-Assisted Therapy Techniques and Intentions with Counseling Guiding Theories. *Journal of Mental Health Counseling*, *32*(4), 354–374.

Chandramouleeswaran, S., & Sudhakar Russell, P. S. (2014). Complementary Psychosocial Interventions in Child and Adolescent Psychiatry: Pet Assisted Therapy. *Indian Journal of Psychological Medicine*, *36*(1), 4–8. https://doi.org/10.4103/0253-7176.127240

Cheung, T., Wong, S. Y., Wong, K. Y., Law, L. Y., Ng, K., Tong, M. T., … Yip, P. S. F. (2016). Depression, Anxiety and Symptoms of Stress among Baccalaureate Nursing Students in

Hong Kong: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, *13*(8), 779. https://doi.org/10.3390/ijerph13080779

Chia-Chun Tsai, Friedmann, E., & Thomas, S. A. (2010). The Effect of Animal-Assisted Therapy on Stress Responses in Hospitalized Children. *Anthrozoos*, *23*(3), 245–258. https://doi.org/10.2752/175303710X12750451258977

Coakley, A. B., & Mahoney, E. K. (2009). Creating a therapeutic and healing environment with a pet therapy program. *Complementary Therapies in Clinical Practice*, *15*(3), 141–146. https://doi.org/10.1016/j.ctcp.2009.05.004

Cowen, K. J., Hubbard, L. J., & Hancock, D. C. (2016). Concerns of nursing students beginning clinical courses: A descriptive study. *Nurse Education Today*, *43*, 64–68. https://doi.org/10.1016/j.nedt.2016.05.001

Crossman, M. K., Kazdin, A. E., & Knudson, K. (2015). Brief unstructures interaction with a dog reduces distress. *Anthrozoos*, *28*(4), 649–659. https://doi.org/10.1080/08927936.2015.1070008

Crump, C., & Derting, T. L. (2015). Effects of Pet Therapy on the Psychological and Physiological Stress Levels of First-Year Female Undergraduates. *North American Journal of Psychology*, *17*(3), 575–590.

Daltry, R. M., & Mehr, K. E. (2015). Therapy Dogs on Campus: Recommendations for Counseling Center Outreach. *Journal of College Student Psychotherapy*, *29*(1), 72–78. https://doi.org/10.1080/87568225.2015.976100

Deary, I. J., Watson, R., & Hogston, R. (2003). A longitudinal cohort study of burnout and attrition in nursing students. *Journal of Advanced Nursing*, *43*(1), 71–81. https://doi.org/10.1046/j.1365-2648.2003.02674.x

DiSalvo, H., Haiduven, D., Johnson, N., Reyes, V. V., Hench, C. P., Shaw, R., & Stevens, D. A. (2006). Who let the dogs out? Infection control did: Utility of dogs in health care settings and infection control aspects. *American Journal of Infection Control*, *34*(5), 301–307. https://doi.org/10.1016/j.ajic.2005.06.005

Duchesne, S., Vitaro, F., Larose, S., & Tremblay, R. E. (2008). Trajectories of Anxiety During Elementary-school Years and the Prediction of High School Noncompletion. *Journal of Youth and Adolescence*, *37*(9), 1134–1146. https://doi.org/10.1007/s10964-007-9224-0

Dunkel-Schetter, C., Folkman, S., & Lazarus, R. S. (1987). Correlates of social support receipt. *Journal of Personality and Social Psychology*, *53*(1), 71–80. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/0022-3514.53.1.71

Dursun, S. (2015). Investigation of high school students attitude and anxiety levels towards Mathematics in terms of some variables. *Educational Research and Reviews*, *10*(13), 1773–1780. https://doi.org/10.5897/ERR2015.2206

Eschleman, K. J., Alarcon, G. M., Lyons, J. B., Stokes, C. K., & Schneider, T. (2012). The dynamic nature of the stress appraisal process and the infusion of affect. *Anxiety, Stress & Coping*, *25*(3), 309–327.

Fine, A. H. (2010). *Handbook on animal-assisted therapy theoretical foundations and guidelines for practice* (3rd ed.). San Diego, CA: Academic Press Inc.

Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality and Social Psychology*, *46*(4), 839–852. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/0022-3514.46.4.839

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social*

Psychology, *48*(1), 150–170. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/0022-3514.48.1.150

Folkman, S., & Lazarus, R. S. (1988). Coping as a mediator of emotion. *Journal of Personality and Social Psychology*, *54*(3), 466–475. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/0022-3514.54.3.466

Friesen, L. (2009). Exploring Animal-Assisted Programs with Children in School and Therapeutic Contexts. *Early Childhood Education Journal*, *37*(4), 261–267. https://doi.org/10.1007/s10643-009-0349-5

Gee, N. R., Crist, E. N., & Carr, D. N. (2010). Preschool Children Require Fewer Instructional Prompts to Perform a Memory Task in the Presence of a Dog. *Anthrozoos*, *23*(2), 173–184. https://doi.org/10.2752/175303710X12682332910051

Gee, N. R., Harris, S. L., & Johnson, K. L. (2007). The Role of Therapy Dogs in Speed and Accuracy to Complete Motor Skills Tasks for Preschool Children. *Anthrozoos*, *20*(4), 375–386.

Giaquinto, S., & Valentini, F. (2009). Is there a scientific basis for pet therapy? *Disability & Rehabilitation*, *31*(7), 595–598. https://doi.org/10.1080/09638280802190735

Gibbons, C., Dempster, M., & Moutray, M. (2011). Stress, coping and satisfaction in nursing students. *Journal of Advanced Nursing*, *67*(3), 621–632. https://doi.org/10.1111/j.1365-2648.2010.05495.x

González Ramírez, M. T., & Landero Hernández, R. (2014). Benefits of dog ownership: Comparative study of equivalent samples. *Journal of Veterinary Behavior: Clinical Applications and Research*, *9*(6), 311–315. https://doi.org/10.1016/j.jveb.2014.08.002

Harper, D. (2010). transactional. *Dictionary.com*.

Jalongo, M. R., & McDevitt, T. (2015). Therapy dogs in academic libraries: A way to foster student engagement and mitigate self-reported stress during finals. *Public Services Quarterly*, *11*(4), 254–269.

Jenkins, C. D., Laux, J. M., Ritchie, M. H., & Tucker-Gail, K. (2014). Animal-Assisted Therapy and Rogers' Core Components Among Middle School Students Receiving Counseling Services: A Descriptive Study. *Journal of Creativity in Mental Health*, *9*(2), 174–187. https://doi.org/10.1080/15401383.2014.899939

Jimenez, C., Navia-Osorio, P. M., & Diaz, C. V. (2010). Stress and health in novice and experienced nursing students. *Journal of Advanced Nursing*, *66*(2), 442–455. https://doi.org/10.1111/j.1365-2648.2009.05183.x

Johnson, R. A., & Meadows, R. L. (2010). Dog-Walking: Motivation for Adherence to a Walking Program. *Clinical Nursing Research*, *19*(4), 387–402. https://doi.org/10.1177/1054773810373122

Karatas, H., Alci, B., & Aydin, H. (2013). Correlation among high school senior students' test anxiety, academic performance and points of university entrance exam. *Educational Research and Reviews*, *8*(13), 919–926. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.5897/ERR2013.1462

Kathleen N. Adamle RN, A., PhD, Tracy A. Riley RN, P., & Tracey Carlson RN, M. (2009). Evaluating College Student Interest in Pet Therapy. *Journal of American College Health*, *57*(5), 545–548. https://doi.org/10.3200/JACH.57.5.545-548

KSDS Assistance Dogs, Inc. (2015). Facility Dogs. Retrieved from http://www.ksds.org/KSDS_dogs_social.htm

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R. (1985). Stress and adaptational outcomes: The problem of confounded measures. *American Psychologist*, *40*(7), 770–779. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/0003-066X.40.7.770

Lazarus, R. S., & Folkman, S. (1984a). *Stress, Appraisal and Coping*. New York, N.Y.: Springer Publishing Company.

Lazarus, R. S., & Folkman, S. (1984b). *Stress, appraisal, and coping*. New York, N.Y.: Springer Publishing Company.

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, *1*(3), 141–169. https://doi.org/10.1002/per.2410010304

Levinson, B. M., & Mallon, G. P. (1997). *Pet-Oriented Child Psychotherapy* (2nd ed.). Springfield, Illinois: Charles C Thomas Publisher, LTD.

LoBiondo-Wood, G., & Haber, J. (2014). *Nursing research: Methods and critical appraisal for evidence-based practice* (8th ed.). St. Louis, MO: Elsevier Mosby.

Mackie, J. E., & Bruce, C. D. (2016). Increasing nursing students' understanding and accuracy with medical dose calculations: A collaborative approach. *Nurse Education Today*, *40*, 146–153. https://doi.org/10.1016/j.nedt.2016.02.018

Maharaj, N., & Haney, C. J. (2015). A Qualitative Investigation of the Significance of Companion Dogs. *Western Journal of Nursing Research*, *37*(9), 1175–1193. https://doi.org/10.1177/0193945914545176

Mahmoud, J. S. R., Staten, R. "Topsy," Lennie, T. A., & Hall, L. A. (2015). The Relationships of Coping, Negative Thinking, Life Satisfaction, Social Support, and Selected

Demographics With Anxiety of Young Adult College Students. *Journal of Child and Adolescent Psychiatric Nursing*, *28*(2), 97–108. https://doi.org/10.1111/jcap.12109

Maloney, E. A., Sattizahn, J. R., & Beilock, S. L. (2014). Anxiety and cognition. *Wiley Interdisciplinary Reviews: Cognitive Science*, *5*(4), 403–411. https://doi.org/10.1002/wcs.1299

Math Anxiety in Elementary School. (2013). *Teaching Children Mathematics*, *19*(7), 405–407. https://doi.org/10.5951/teacchilmath.19.7.0405

Maxwell, J. A. (2013). *Qualitative research design an interactive approach* (3rd ed.). Thousand Oaks, California: SAGE Publications, Inc.

Mitsui, S., Yamamoto, M., Nagasawa, M., Mogi, K., Kikusui, T., Ohtani, N., & Ohta, M. (2011). Urinary oxytocin as a noninvasive biomarker of positive emotion in dogs. *Hormones and Behavior*, *60*(3), 239–243. https://doi.org/10.1016/j.yhbeh.2011.05.012

Nagasawa, M., Kikusui, T., Onaka, T., & Ohta, M. (2009). Dog's gaze at its owner increases owner's urinary oxytocin during social interaction. *Hormones and Behavior*, *55*(3), 434–441. https://doi.org/10.1016/j.yhbeh.2008.12.002

Nagasawa, M., Mitsui, S., En, S., Ohtani, N., Ohta, M., Sakuma, Y., … Kikusui, T. (2015). Oxytocin-Gaze Positive Loop and the Coevolution of Human-Dog Bonds: *Obstetrical & Gynecological Survey*, *70*(7), 450–451. https://doi.org/10.1097/01.ogx.0000469196.99143.92

Nelson, D. W., & Knight, A. E. (2010). The Power of Positive Recollections: Reducing Test Anxiety and Enhancing College Student Efficacy and Performance. *Journal of Applied Social Psychology*, *40*(3), 732–745. https://doi.org/10.1111/j.1559-1816.2010.00595.x

Nepps, P., Stewart, C. N., & Bruckno, S. R. (2014). Animal-Assisted Activity Effects of a Complementary Intervention Program on Psychological and Physiological Variables. *Journal of Evidence-Based Complementary & Alternative Medicine*, *19*(3), 211–215. https://doi.org/10.1177/2156587214533570

Neuman, B. (1995). *The Neuman Systems Model* (3rd ed.). Norwalk, Connecticut: Appleton & Lange.

Pachana, N. A., Massavelli, B. M., & Robleda-Gomez, S. (2011). A developmental psychological perspective on the human-animal bond. In *The psychology of the human-animal bond* (pp. 151–165). Springer Science+Business Media, LLC.

Parenti, L., Foreman, A., Jean Meade, B., & Wirth, O. (2013). A revised taxonomy of assistance animals. *Journal of Rehabilitation Research & Development*, *50*(6), 745–756.

Patterson, S. L. (2016). The effect of emotional freedom technique on stress and anxiety in nursing students: A pilot study. *Nurse Education Today*, *40*, 104–110.

Pikhartova, J., Bowling, A., & Victor, C. (2014). Does owning a pet protect older people against loneliness? *BMC Geriatrics*, *14*, 106. https://doi.org/10.1186/1471-2318-14-106

Polheber, J. P., & Matchock, R. L. (2014). The presence of a dog attenuates cortisol and heart rate in the Trier Social Stress Test compared to human friends. *Journal of Behavioral Medicine*, *37*(5), 860–867. https://doi.org/10.1007/s10865-013-9546-1

Prato, C. A., & Yucha, C. B. (2013). Biofeedback-assisted relaxation training to decrease test anxiety in nursing students.(NURSING EDUCATION RESEARCH / RELAXATION AND TEST ANXIETY). *Nursing Education Perspectives*, *34*(2), 76.

Reeve, K. L., Shumaker, C. J., Yearwood, E. L., Crowell, N. A., & Riley, J. B. (2013). Perceived stress and social support in undergraduate nursing students' educational experiences. *Nurse Education Today*, *33*(4), 419–424. https://doi.org/10.1016/j.nedt.2012.11.009

San Filippo, M. (2013). AVMA releases new stats on pet ownership, ranking top/bottom 10 states. American Veterinary Medical Association. Retrieved from www.avma.org/new/pressroom

Segool, N. K., Carlson, J. S., Goforth, A. N., von der Embse, N., & Barterian, J. A. (2013). Heightened Test Anxiety Among Young Children: Elementary School Students' Anxious Responses to High-Stakes Testing. *Psychology in the Schools*, *50*(5), 489–499. https://doi.org/10.1002/pits.21689

Shearer, A., Hunt, M., Chowdhury, M., & Nicol, L. (2016). Effects of a brief mindfulness meditation intervention on student stress and heart rate variability. *International Journal of Stress Management*, *23*(2), 232–254. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/a0039814

Shubert, J. (2012). Therapy Dogs and Stress Management Assistance During Disasters. *U.S. Army Medical Department Journal*, 74–78.

Somervill, J. W., Kruglikova, Y. A., Robertson, R. L., Hanson, L. M., & MacLin, O. H. (2008). Physiological Responses by College Students to a Dog and a Cat: Implications for Pet Therapy. *North American Journal of Psychology*, *10*(3), 519–528.

Spielberger, C. D. (1972). *Anxiety current trends in theory and research*. New York, N.Y.: Academic Press Inc.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983, 2015). State-Trait Anxiety Inventory for Adults manual. Mind Garden Inc.

Spielberger, C. D., & Vagg, P. R. (1995). *Test anxiety theory, assessment and treatment*. Washington, D.C.: Taylor & Francis.

Stewart, L. A., Dispenza, F., Parker, L., Chang, C. Y., & Cunnien, T. (2014). A Pilot Study Assessing the Effectiveness of an Animal-Assisted Outreach Program. *Journal of Creativity in Mental Health*, *9*(3), 332–345. https://doi.org/10.1080/15401383.2014.892862

Torres, A., Arnold, K. L., & Shutt, E. M. (2016). The Effects of Visual Pet Stimuli on Stress and Math Performance. *College Student Journal*, *50*(1), 112–120.

Vagnoli, L., Caprilli, S., Vernucci, C., Zagni, S., Mugnai, F., & Messeri, A. (2015). Can presence of a dog reduce pain and distress in children during venipuncture? *Pain Management Nursing*, *16*(2), 89–95.

van der Riet, P., Rossiter, R., Kirby, D., Dluzewska, T., & Harmon, C. (2015). Piloting a stress management and mindfulness program for undergraduate nursing students: Student feedback and lessons learned. *Nurse Education Today*, *35*(1), 44–49. https://doi.org/10.1016/j.nedt.2014.05.003

Viau, R., Arsenault-Lapierre, G., Fecteau, S., Champagne, N., Walker, C.-D., & Lupien, S. (2010). Effect of service dogs on salivary cortisol secretion in autistic children. *Psychoneuroendocrinology*, *35*(8), 1187–1193. https://doi.org/10.1016/j.psyneuen.2010.02.004

Walker, A. F., Johnson, C., Schatz, D. A., Silverstein, J. H., & Rohrs, H. J. (2015). Puppy Love, Adolescence, and Chronic Illness: The Importance of Pets for Youth with Type 1 Diabetes. *Journal of Patient Experience*, *2*(1), 21–24. https://doi.org/10.1177/237437431500200105

Williams, B., & Davis, S. (2016). Maths anxiety and medication dosage calculation errors: A scoping review. *Nurse Education in Practice*, *20*, 139–146. https://doi.org/10.1016/j.nepr.2016.08.005

Wilson, C. C. (1991). The pet as an anxiolytic intervention. *The Journal of Nervous and Mental Disease*, *179*(8), 482–489.

Wisdom, J. P., Saedi, G. A., & Green, C. A. (2009). Another breed of "service" animals: STARS study findings about pet ownership and recovery from serious mental illness. *American Journal of Orthopsychiatry*, *79*(3), 430–436. https://doi.org/http://dx.doi.org.www2.lib.ku.edu/10.1037/a0016812

Wohlfarth, R., Mutschler, B., Beetz, A., Kreuser, F., & Korsten-Reck, U. (2013). Dogs motivate obese children for physical activity: key elements of a motivational theory of animal-assisted interventions. *Movement Science and Sport Psychology*, *4*, 796. https://doi.org/10.3389/fpsyg.2013.00796

Young, J. S. (2012). Pet Therapy: Dogs De-Stress Students. *Journal of Christian Nursing*, *29*(4), 217–221. https://doi.org/10.1097/CNJ.0b013e31826701a7

Zuckerman, M., & Spielberger, C. D. (1976). *Emotions and anxiety*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Appendix A

INFORMED CONSENT FORM

TITLE OF STUDY: Baker University Student Status Survey (BUS^3)

INTRODUCTION

The Department of Curriculum and Teaching at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

The purpose of this study is to assess Baker University Bachelor of Science in Nursing (BSN) students' feelings prior to the medication calculation exam.

PROCEDURES

Today you will complete a self evaluation questionnaire which will take approximately ten minutes to complete. You will return approximately one hour to one and one-half hours early the first day of the Spring 18 semester prior to the Medication Calculation Exam. You will be assigned to one of two groups. In either group you will complete a self-evaluation questionnaire at four different time points throughout the study—you will complete two questionnaires on the day of the exam and one later in the Spring semester. Each questionnaire will take approximately ten minutes to complete. If you are in one of two groups, you may have a personal interview later in the Spring semester. Your identity will be held in confidence. Group Medication Calculation Exam scores will be accessed as part of the study; they will not be shared with any parties; the purpose of the disclosure is to determine statistical differences between two groups. As with all student exams, each student has access to his or her individual score through the Baker examsoft website. The time requirement for your participation in one of these two groups will be approximately one to two (1-2) hours total in divided sessions. After completing the study you will receive detailed information regarding its nature.

RISKS There are minimal risks to this study.

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BENEFITS You may receive personal benefit through the self-evaluative process.

PAYMENT TO PARTICIPANTS

There is not payment to participants for this study. All students who participate in this study will receive coffee and donuts the morning of the Medication Calculation Exam in the Spring 2018 semester.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researcher will use a number instead of your name. The researcher will not share information about you individually unless required by law or unless you give written permission. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from Baker University or to participate in any programs or events of Baker University. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about you, in writing, at any time, by sending your written request to: Della Anderson, Baker University School of Nursing, 1500 SW 10th, Topeka, Kansas 66604. If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

KU Lawrence IRB # STUDY00141243 | Approval Period 8/16/2017 – 8/15/2018

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385 or write the , University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email irb@ku.edu

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

[redacted]

Type/Print Participant's Name

_____ Participant's Signature

Date

Researcher Contact Information

Della Anderson Principal Investigator 1500 SW 10th Topeka, KS 66604 785 354-5838

d602a982@ku.edu

Dr. Steven H. White Committee Chair Department of Curriculum and Teaching 1122 West Campus Road University of Kansas Lawrence, KS 66045

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Appendix B

INFORMED CONSENT FORM

TITLE OF STUDY: Baker University Student Status Survey (BUS^3)

INTRODUCTION

The Department of Curriculum and Teaching at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

The purpose of this study is to assess Baker University Bachelor of Science in Nursing (BSN) students' feelings prior to the medication calculation exam.

PROCEDURES

You have been randomly assigned to one of two groups. In this group you will complete a self-evaluation questionnaire at three different time points—one prior to the medication exam today, one immediately after the medication exam today, and one later in the semester. The questionnaire takes about ten minutes to complete. You will be asked to participate in a 35-45 minute session interacting with dogs today. Later in the semester, you may be asked to complete a personal interview. Your identity will be held in confidence. Group Medication Calculation Exam scores will be accessed as part of the study; they will not be shared with any parties; the purpose of the disclosure is to determine statistical differences between two groups. As with all student exams, each student has access to his or her individual score through the Baker examsoft website. The time requirement for your participation in one of these two groups will be approximately one to two (1-2) hours total in divided sessions. After completing the study you will receive detailed information regarding its nature.

RISKS There are minimal risks to this study. Please answer the following questions: Are you allergic to dogs? Yes No Are you scared of dogs? Yes No Do you have hay fever or asthma? Yes No If yes, please list: _____ If you answered yes to any

questions above, please notify the researcher at this time.

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BENEFITS You may receive personal benefit through the self-evaluative process.

PAYMENT TO PARTICIPANTS There is not payment to participants for this study. You will receive coffee and donuts today. PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researcher will use a number instead of your name. The researcher will not share information about you individually unless required by law or unless you give written permission. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from Baker University or to participate in any programs or events of Baker University. However, if you refuse to sign, you cannot participate in this study.

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_____ _____

[redacted]

Type/Print Participant's Name

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Date

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d602a982@ku.edu

Dr. Steven H. White Committee Chair Department of Curriculum and Teaching 1122 West Campus Road University of Kansas Lawrence, KS 66045

Appendix C

INFORMED CONSENT FORM

TITLE OF STUDY: Baker University Student Status Survey (BUS^3)

INTRODUCTION

The Department of Curriculum and Teaching at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

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PROCEDURES

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RISKS There are minimal risks to this study.

BENEFITS You may receive personal benefit through the self-evaluative process.

PAYMENT TO PARTICIPANTS

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There is not payment to participants for this study. You will receive coffee and donuts today.

PARTICIPANT CONFIDENTIALITY

Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researcher will use a number instead of your name. The researcher will not share information about you individually unless required by law or unless you give written permission. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from Baker University or to participate in any programs or events of Baker University. However, if you refuse to sign, you cannot participate in this study.

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KU Lawrence IRB # STUDY00141243 | Approval Period 8/16/2017 – 8/15/2018

I agree to take part in this study as a research participant. By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____ _____

Type/Print Participant's Name

_____ Participant's Signature

Date

Researcher Contact Information

Della Anderson Principal Investigator 1500 SW 10th Topeka, KS 66604 785 354-5838

d602a982@ku.edu

Dr. Steven H. White Committee Chair Department of Curriculum and Teaching 1122 West Campus Road University of Kansas Lawrence, KS 66045

Appendix D

DEBRIEFING STATEMENT

TITLE OF STUDY: Baker University Student Status Survey (BUS^3)

INTRODUCTION

Thank you for participating in the Baker University Student Status Survey ($BUS^{3)}$. Your participation is helpful to students, faculty, and the School of Nursing, as well as, the nursing profession in completing important and sound or accurate research. We understand your participation was voluntary and appreciate the time and respect you dedicated to this research study.

PURPOSE OF THE STUDY

The purpose of this study was to assess Baker University Bachelor of Science in Nursing (BSN) students' feelings prior to the medication calculation exam. This study examined the effect of animal-assisted therapy on student anxiety as it related to the medication calculation exam. The study explored if anxiety was decreased when students were able to interact with a dog prior to the exam.

INCOMPLETE DISCLOSURE

There was an incomplete disclosure about the study so as not to influence any of the self-evaluative process. The questionnaire you completed was the Spielberger's State-Trait Anxiety Inventory (STAI), which measures both trait characteristics of anxiety in a person and also the state of a person's anxiety in a given situation. The dogs were certified therapy dogs trained to give comfort and reduce a person's anxiety in a given situation. It was necessary that this information be revealed after the study was over so there were not preconceived ideas or knowledge and the results of the study were not skewed or the data results were not misinformed. The purpose of research is to get clear and accurate data collection, which is the reason for the incomplete disclosure at the time of the data collection.

CANCELLING AUTHORIZATION

You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about you, in writing, at any time, by sending your written request to: Della Anderson, Baker University School of Nursing,

1500 SW 10th, Topeka, Kansas 66604. If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

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QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researcher listed at the end of this consent form. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385 or write the

, University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email irb@ku.edu

[redacted]

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